SOIL SURVEY OF

Lipscomb County, Texas

United States Department of Agriculture
Soil Conservation Service
In cooperation with
Texas Agricultural Experiment Station

Major fieldwork for this soil survey was done in the period 1965–70. Soil names and descriptions were approved in 1971. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1971. This survey was made cooperatively by the Soil Conservation Service and the Texas Agricultural Experiment Station. It is part of the technical assistance furnished to the Lipscomb County Soil and Water Conservation District.

Either enlarged or reduced copies of the soil map in this publication can be made by commercial photographers, or they can be purchased on individual order from the Cartographic Division, Soil Conservation Service, United States Department of Agriculture, Washington, D.C. 20250.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms and ranches; in selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts of land for farming, industry, and recreation.

Locating Soils

All the soils of Lipscomb County are shown on the detailed map at the back of this publication. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbols. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information. This guide lists all the soils of the county in alphabetic order by map symbol and gives the capability classification of each. It also shows the page where each soil is described and the page for the range site in which the soil has been placed.

Individual colored maps showing the relative suitability or degree of limitation of soils for many specific purposes can be developed by using the soil map and the information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions and from the discussions of the capability units and the range sites.

Game managers, sportsmen, and others can find information about soils and wildlife in the section "Wildlife."

Ranchers and others can find, under "Range," groupings of the soils according to their suitability for range, and also the names of many of the plants that grow on each range site.

Community planners and others can read about soil properties that affect the choice of sites for dwellings, industrial buildings, and recreation areas in the section "Engineering Uses of the Soils."

Engineers and builders can find, under "Engineering Uses of the Soils," tables that contain test data, estimates of soil properties, and information about soil features that affect engineering practices.

Scientists and others can read about how the soils formed and how they are classified in the section "Formation and Classification of the Soils."

Newcomers in Lipscomb County may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the information about the county given in the section "General Nature of the County."

Cover: **Cattle grazing on Tipton loam, 1 to 3 percent slopes, on Deep Hardland range site.**

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Issued December 1975

SOIL SURVEY OF LIPSCOMB COUNTY, TEXAS

BY JACK C. WILLIAMS, SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE,
IN COOPERATION WITH THE TEXAS AGRICULTURAL EXPERIMENT STATION

LIPSCOMB COUNTY is in the northeastern corner of the Texas Panhandle (fig. 1). It has a total area of 597,760 acres, or 934 square miles. The town of Lipscomb is the county seat. Most of the county is in the Rolling Plains section of the Southern Great Plains. About 43 square miles in the northwestern and north-central parts of the county is in the High Plains section of the Southern Great Plains. Elevation ranges from 2,350 to 2,850 feet.

Ranching and farming are important in the county. The soils are mostly nearly level to sloping and are used mainly for range and crops. About 421,433 acres is used for range, 160,225 acres for dryland farming, and 10,882 acres for irrigated farming. Grain sorghum and wheat are the main cash crops. Other important crops are forage sorghum, corn, alfalfa, and millet. The principal livestock is cattle.

The Panhandle and Santa Fe Railroad and farm-related industries provide full- or part-time jobs for many people in the county. Many oil and gas wells have been drilled since 1950. The gas and oil industry also has added a considerable amount of income to the county during the last two decades.

U.S. Highway No. 60 crosses the southeastern part of the county, and U.S. Highway No. 83 crosses the southwest corner of the county. Texas Highways No. 15, 213, and 305 also cross the county. There are numerous farm roads throughout the county. The main line of the Panhandle and Santa Fe Railroad runs through Higgins, and another track of that railroad runs across the northern part of the county in an east-west direction. There are paved airstrips at Booker, Follett, and Higgins.

The climate of Lipscomb County is characterized by periods of drought and high winds.

The county is in the Canadian River watershed. The drainage flow for most of the county is into Kiowa Creek or into Wolf Creek, which flow into the North Canadian River. The drainage flow for a small portion of the southern part of the county is into small creeks that flow directly into the Canadian River only a few miles away in Hemphill County or in Oklahoma. Numerous spring-fed streams are in the county. Wolf Creek flows most of the year, except in midsummer.

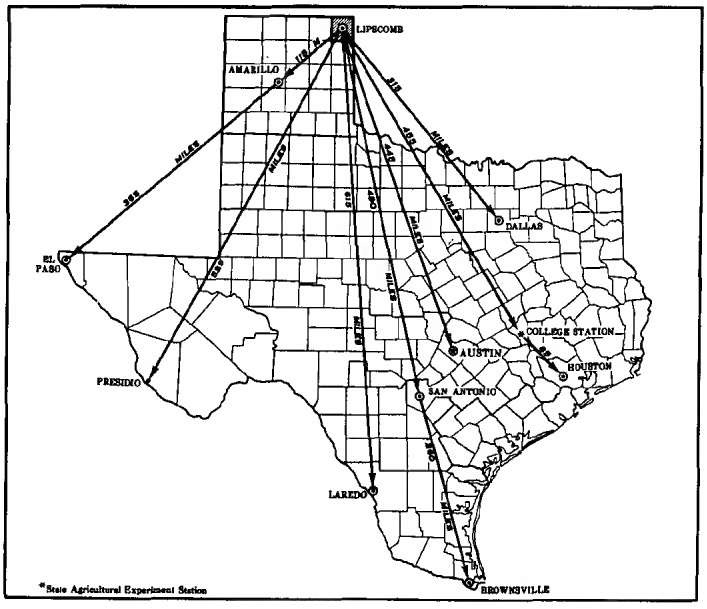

Figure 1.—Location of Lipscomb County in Texas.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Lipscomb County, where they are located, and how they can be used. The soil scientists went into the county knowing they likely would find many soils they had already seen and perhaps some they had not. They observed the steepness, length, and shape of slopes, the size and speed of streams, the kinds of native plants or crops, the kinds of rock, and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by the action of plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The *soil series* and the *soil phase* are the categories of soil classification most used in a local survey.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town

or other geographic feature near the place where a soil of that series was first observed and mapped. Darrouzett and Likes, for example, are the names of two soil series. All the soils in the United States that have the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface layer and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Mobeetie fine sandy loam, 3 to 5 percent slopes, is one of several phases within the Mobeetie series.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some kind that have been seen within an area that is dominantly of a recognized soil phase.

Some mapping units are made up of soils of different series, or of different phases within one series. Three such kinds of mapping units are shown on the soil map of Lipscomb County: the soil complex, the soil association, and the undifferentiated group.

A soil complex consists of areas of two or more soils, so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. Generally, the name of a soil complex consists of the names of the dominant soils, joined by a hyphen. Estacado-Olton complex, 0 to 3 percent slopes, is an example.

A soil association is made up of adjacent soils that occur as areas large enough to be shown individually on the soil map but are shown as one unit because the time and effort of delineating them separately cannot be justified. There is a considerable degree of uniformity in pattern and relative extent of the dominant soils, but the soils may differ greatly one from another. The name of an association consists of the names of the dominant soils, joined by a hyphen. Mobeetie-Potter association, rolling, is an example.

An undifferentiated group is made up of two or more soils that could be delineated individually but are shown as one unit because, for the purpose of the soil survey, there is little value in separating them. The pattern and proportion of soils are not uniform. An area shown on the map may be made up of only one of the dominant soils, or of two or more. Paloduro, Veal, and Portales soils, 3 to 5 percent slopes, is an undifferentiated soil group in this county.

While a soil survey is in progress, soil scientists take soil samples needed for laboratory measurements and for engineering tests. Laboratory data from the same kind of soil in other places are also assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kind of soil. Yields under defined management are estimated for all the soils.

Soil scientists observe how soils behave when used as a growing place for native and cultivated plants and as material, foundation, or covering for structures. They relate this behavior to properties of the soils. For example, they observe that filter fields for onsite disposal of sewage fail on a given kind of soil, and they relate this to the slow permeability of the soil or to its high water table. They see that streets, road pavements, and foundations for houses are cracked on a named kind of soil and they relate this to the high shrink-swell potential of the soil material. Thus, they use observation and knowledge of soil properties, together with available research data, to predict limitations or suitability of soils for present and potential uses.

After data have been collected and tested for the key, or benchmark, soils in a survey area, the soil scientists set up trial groups of soils. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others. They then adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under current methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in Lipscomb County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide in managing a watershed, a wooded tract, or a wildlife area, or in planning engineering works, recreational facilities, or community developments. It is not a suitable map for planning the management of a farm or field or for selecting the exact location of a road, building, or similar structure, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect their management.

The soil associations in Lipscomb County are discussed in the following pages. The terms for texture used in the titles of the associations apply to the texture of the surface layer. For example, in the title of association 1, the words "medium textured to moderately fine textured" refer to the surface layer of the major soils in the association.

1. Acuff-Olton-Darrouzett association

Deep, nearly level to gently sloping, medium textured to moderately fine textured soils

This association is on ridges and interstream divides below the level of the High Plains. Areas of the association have well-defined drainageways.

The association makes up about 32 percent of the county. About 19 percent is Acuff soils, 14 percent is Olton soils, 11 percent is Darrouzett soils, and the remaining 56 percent is minor soils (fig. 2).

The Acuff soils are on ridges and hillsides. They have a surface layer of dark-brown loam about 5 inches thick. The next layer is reddish-brown and yellowish-red clay loam in the upper 35 inches, reddish-yellow sandy clay loam in the next 15 inches, and light-brown sandy clay loam in the lower 20 inches.

The Olton soils are on ridges and hillsides. They have a surface layer of dark-brown clay loam about 10 inches thick. The next layer, in sequence from the top, is 6 inches of dark-brown clay loam, 20 inches of reddish-brown clay loam, and 9 inches of pink clay loam. Below this it is reddish-yellow clay loam.

The Darrouzett soils are on ridges, on hillsides, and along drainageways. They have a surface layer of grayish-brown silty clay loam about 6 inches thick. The next layer is dark grayish-brown silty clay loam in the upper 17 inches, dark-brown, brown, and strong-brown silty clay loam to clay loam in the next 52 inches, and pink silty clay loam to a depth of 100 inches.

Minor soils are in the Paloduro, Bippus, Spur, Veal, Tipton, Portales, Mansker, and Estacado series. These soils are in convex areas on hillsides and in drainageways.

This association is used for crops and range. A small acreage is irrigated. The major needs in the management of the soils in this association for crops are the maintenance of tilth and fertility and the control of soil blowing and water erosion.

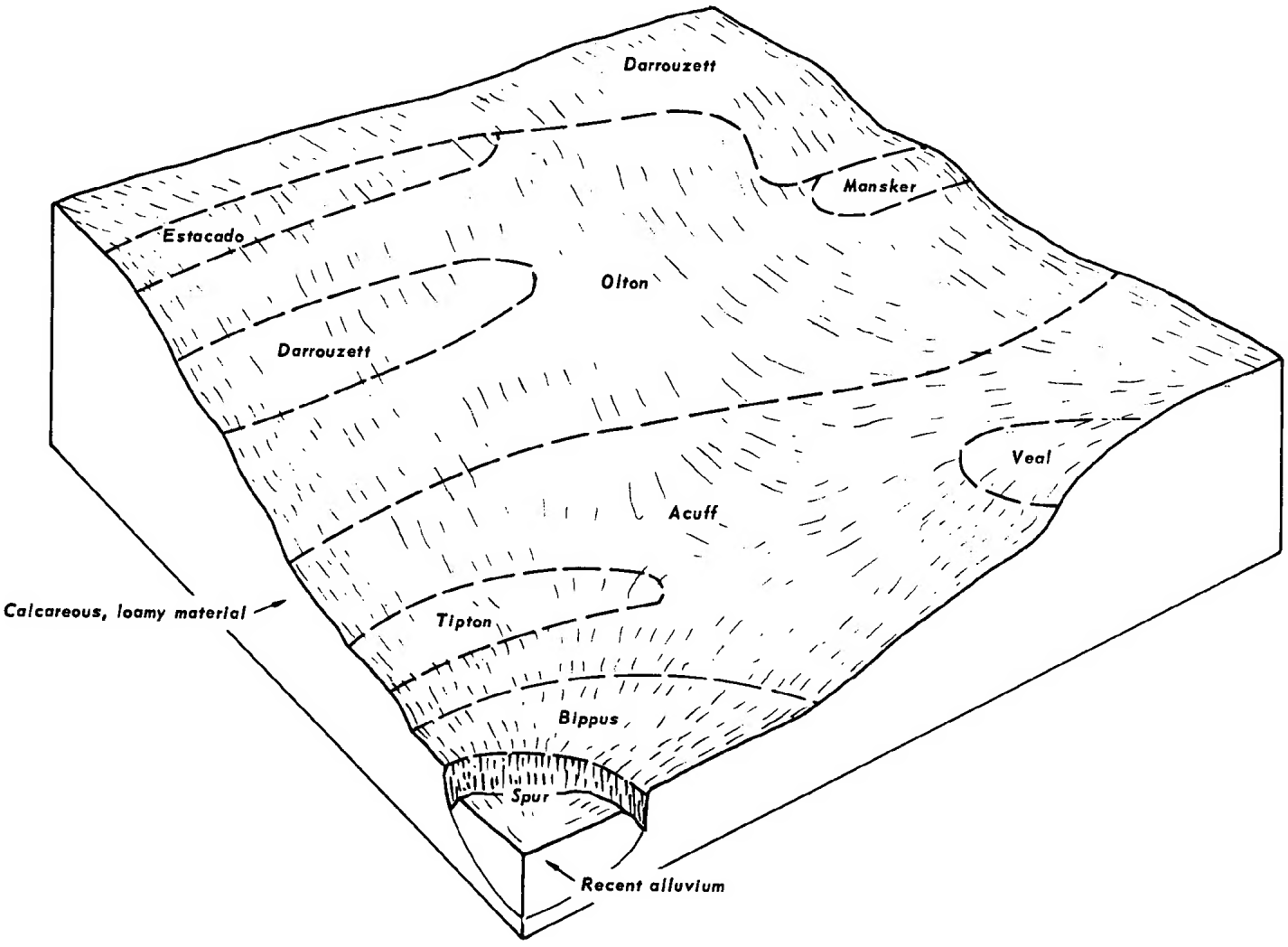

Figure 2.—**Pattern of soils and underlying material in association 1.**

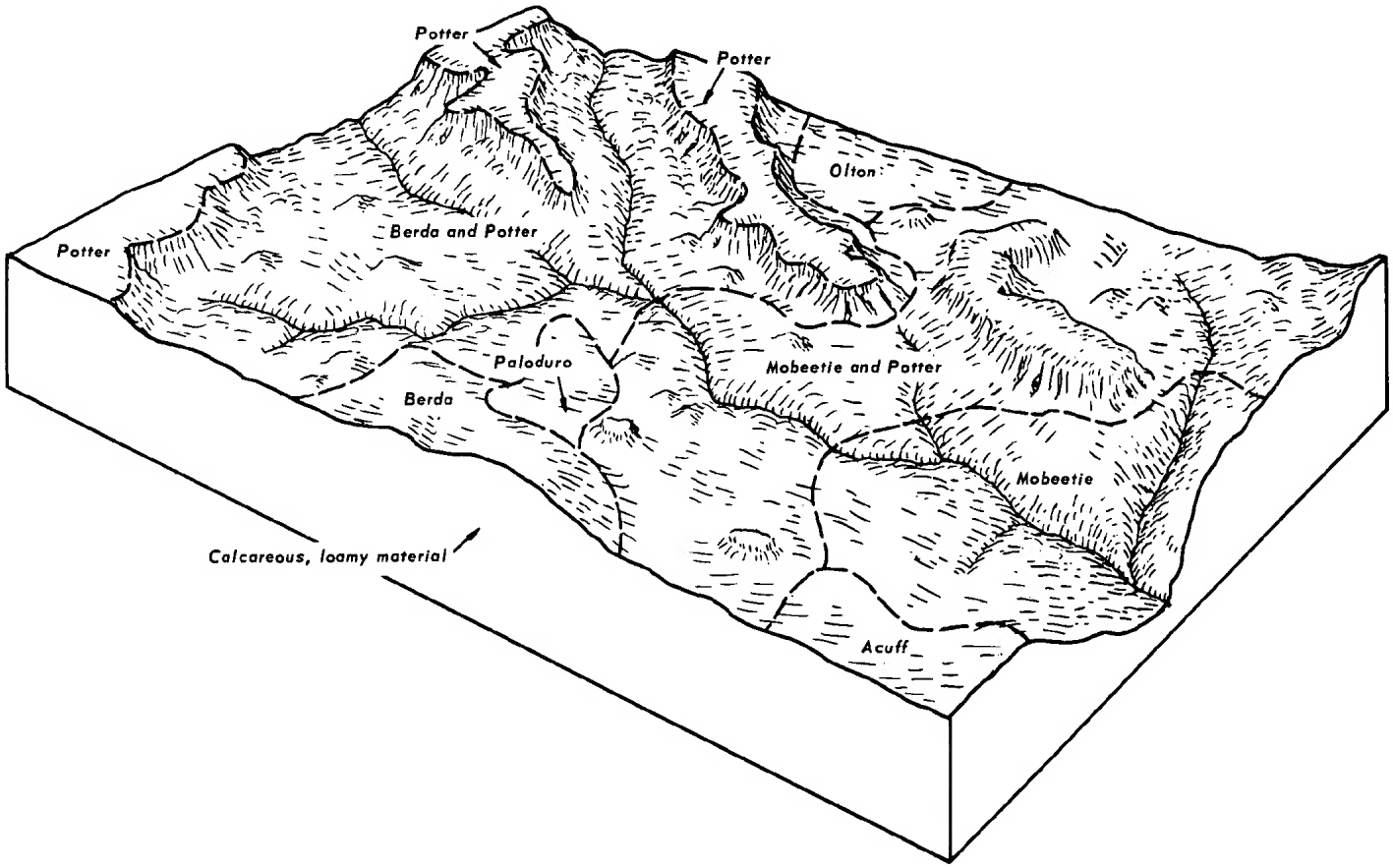

Figure 3.—**Pattern of soils and underlying material in association 2.**

2. *Mobeetie-Potter-Berda association*

Deep to very shallow, gently sloping to moderately steep, moderately coarse textured to medium textured soils

This association is in the steeper areas of the county. Areas of this association are along drainageways that have cut deeply into calcareous, loamy material. Geological erosion is active, and escarpments continue to advance up some of the drainageways.

The association makes up about 28 percent of the county. About 31 percent is Mobeetie soils, 19 percent is Potter soils, 15 percent is Berda soils, and the remaining 35 percent is minor soils (fig. 3).

The Mobeetie soils are on hillsides and alluvial fans. They have a surface layer of grayish-brown fine sandy loam about 8 inches thick. The next layer is brown fine sandy loam in the upper 10 inches and light yellowish-brown fine sandy loam in the lower 24 inches. The underlying material is light-brown fine sandy loam.

The Potter soils are in areas on ridges along the caprock remnants. They have a surface layer of grayish-brown loam and gravelly loam about 10 inches thick. The underlying material is mainly pinkish-white, weakly cemented caliche.

The Berda soils are on hillsides and foot slopes. They have a surface layer of grayish-brown loam about 9 inches thick. Beneath this is brown loam to a depth of 70 inches.

Minor soils are in the Acuff, Bippus, Mansker, Olton, Portales, Spur, Tipton, and Veal series. They are mainly on ridges or in small valleys.

This association is used mostly for range. A few crops are grown in small areas on ridges and valley floors. The major need in the management of the soils in this association for range is the maintenance of a sufficient cover of grasses to control erosion and to increase the amount of moisture that soaks into the soil.

3. *Devol-Tivoli-Likes association*

Deep, gently sloping to steep, coarse-textured soils

This association is on sand mounds, hills, and dunes that cover large areas. This association consists of sandy soils that have poorly defined drainageways.

This association makes up about 20 percent of the county. About 43 percent is Devol soils, 23 percent is Tivoli soils, 12 percent is Likes soils, and the remaining 22 percent is minor soils (fig. 4).

The Devol soils are on choppy, irregular ridges, hillsides, and mounds. They have a surface layer of brown loamy fine sand about 10 inches thick. The next layer is brown fine sandy loam in the upper 14 inches

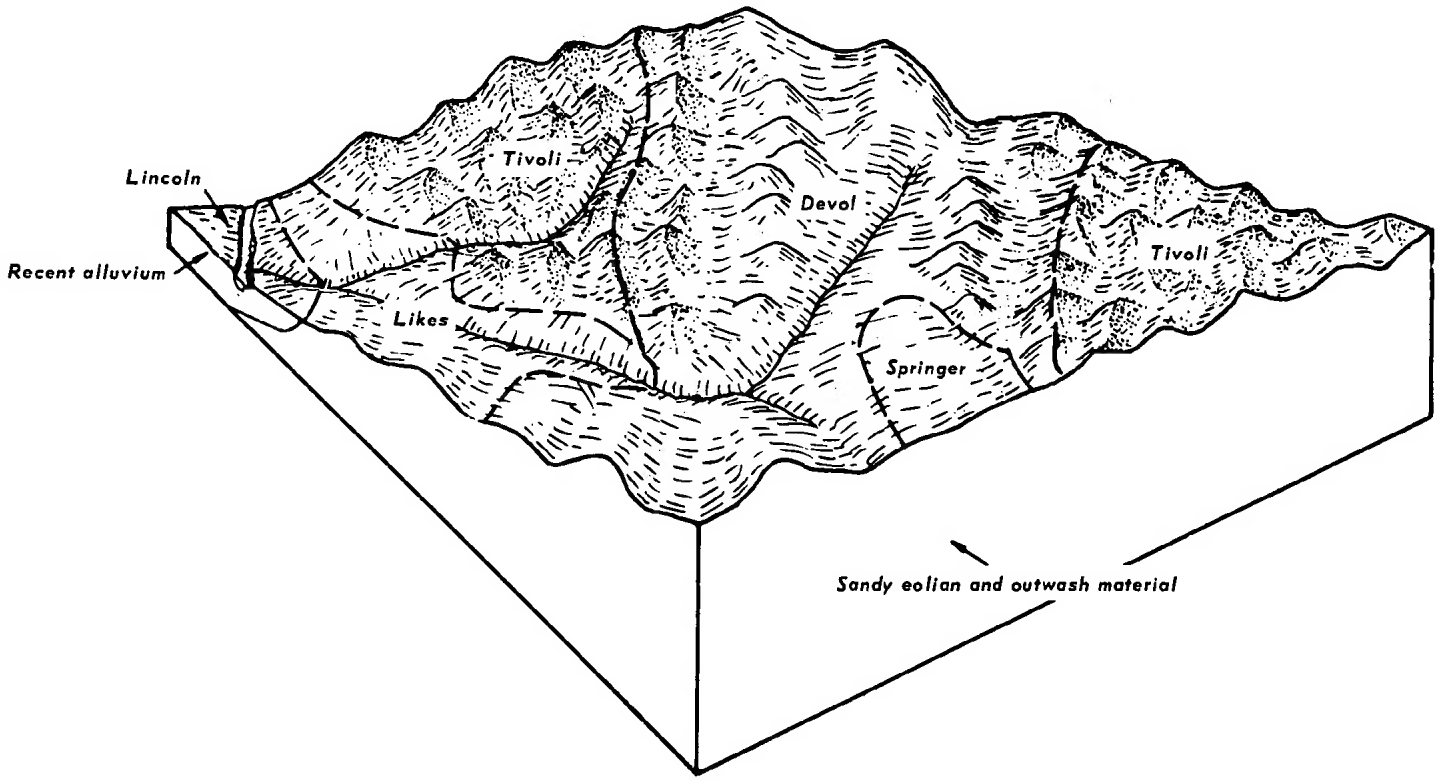

Figure 4.—**Pattern of soils and underlying material in association 3.**

and brown loamy fine sand in the lower 21 inches. The underlying material, extending to a depth of 85 inches, is light-brown loamy fine sand.

The Tivoli soils are in duned areas. They have a surface layer of brown fine sand about 8 inches thick. The underlying material is light yellowish-brown and very pale brown fine sand.

The Likes soils are in undulating areas. They have a surface layer of brown loamy fine sand about 5 inches thick. The underlying material is pale-brown and light yellowish-brown loamy sand.

Minor soils are in the Grandfield, Guadalupe, Lincoln, Mobeetie, Springer, Spur, Sweetwater, and Veal series. They mostly are on ridges or in valleys.

This association is used for range. The major need in the management of the soils is the maintenance of a cover of native grasses to control soil blowing and to reduce the amount of brush in many areas.

4. Grandfield-Veal association

Deep, gently sloping, moderately coarse textured to medium textured soils

This association is on uplands. Some areas of the association have poorly defined drainageways, and others have well-defined drainageways.

This association makes up about 15 percent of the county. About 42 percent is Grandfield soils, 16 percent is Veal soils, and the remaining 42 percent is minor soils (fig. 5).

The Grandfield soils are on plains. They have a surface layer of brown fine sandy loam about 8 inches thick. The next layer is brown and light-brown sandy clay loam about 38 inches thick. The underlying material is reddish-yellow fine sandy loam.

The Veal soils are in convex areas on hillsides and along drainageways. They have a surface layer of grayish-brown loam about 9 inches thick. The next layer is pale-brown clay loam in the upper 7 inches and pinkish-gray clay loam in the lower 12 inches. The underlying material is pink loam.

Minor soils are in the Altus, Berda, Mansker, Mobeetie, Spur, Sweetwater, Tipton, and Tivoli series. They are on ridges, on hillsides, in depressions, or on bottom lands.

This association is used for crops and range. The major need in the management of the soils in this association is the control of soil blowing and water erosion.

5. Pullman-Darrouzett-Estacado association

Deep, nearly level to gently sloping, moderately fine textured soils

This association is on weakly undulating plains in the High Plains part of the county. Part of the water flows into intermittent lakes where it remains until it evaporates, and part flows into shallow drainageways.

This association makes up about 5 percent of the county. About 31 percent is Pullman soils, 30 percent is Darrouzett soils, 25 percent is Estacado soils, and the remaining 14 percent is minor soils (fig. 6).

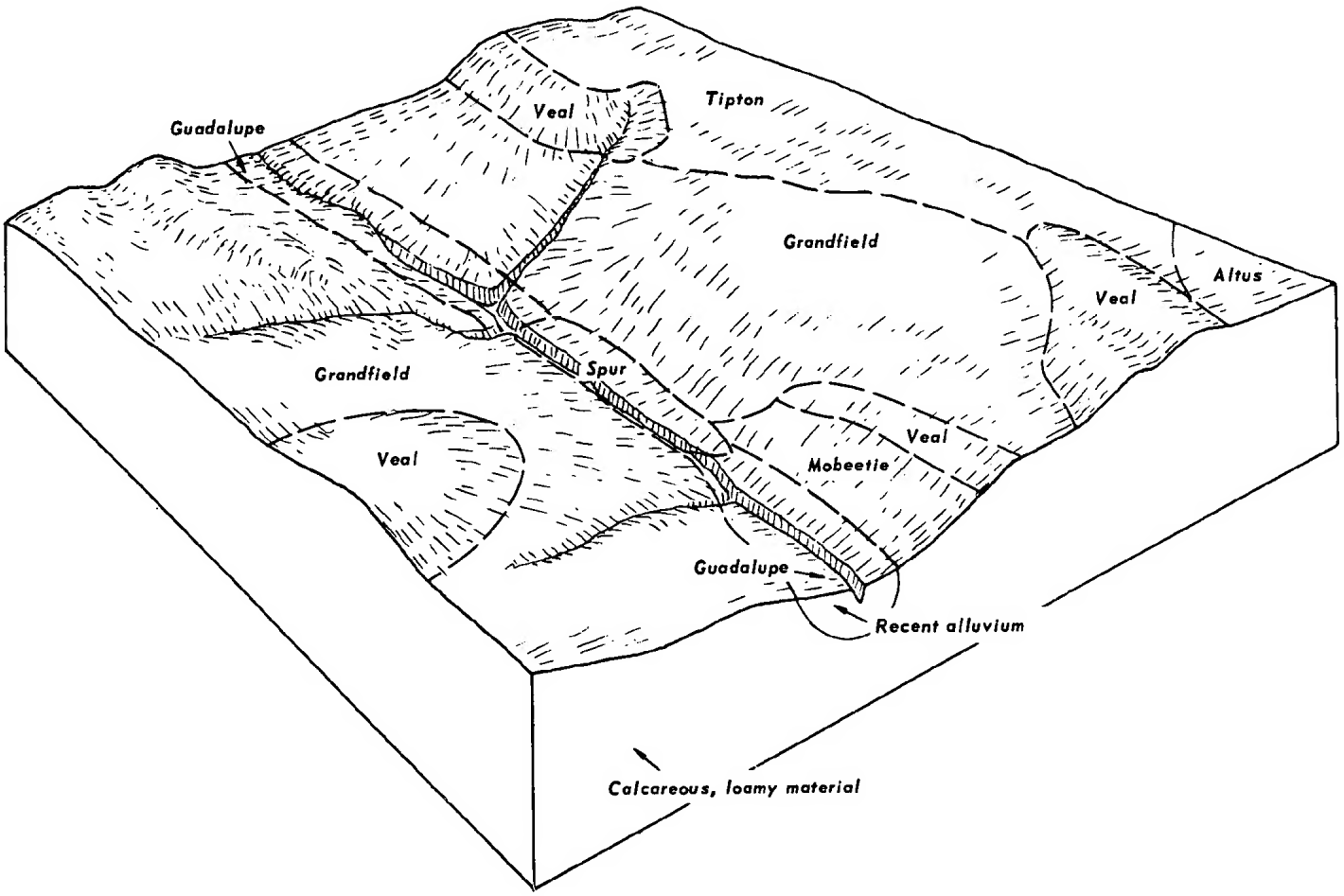

Figure 5.—**Pattern of soils and underlying material in association 4.**

The Pullman soils are in plane areas and areas around playas and drainageways. They have a surface layer of dark grayish-brown silty clay loam about 8 inches thick. The next layer is dark grayish-brown to brown clay in the upper 47 inches, yellowish-red clay loam in the next 15 inches, and light-brown clay loam below.

The Darrouzett soils are in areas that are plane, weakly concave, or convex. They have a surface layer of grayish-brown silty clay loam about 6 inches thick. The next layer, in sequence from the top, is 17 inches of dark grayish-brown silty clay loam, 32 inches of dark-brown to brown silty clay loam, and 20 inches of strong-brown clay loam. Beneath this it is pink silty clay loam.

The Estacado soils are on convex mounds and along drainageways. They have a surface layer of dark grayish-brown silty clay loam about 13 inches thick. The next layer, in sequence from the top, is 29 inches of light-brown clay loam, 10 inches of reddish-yellow clay loam, and 23 inches of light-brown clay loam. Beneath this it is reddish-yellow clay loam.

Minor soils are in the Mansker, Olton, and Randall series.

The association is used mostly for crops. About half of the area is irrigated. The major needs in the management of the soils in this association are maintaining tilth and structure of the surface layer, controlling soil blowing, and controlling water erosion on the gently sloping soils.

Descriptions of the Soils

This section describes the soil series and mapping units in Lipscomb County. Each soil series is described in detail, and then, briefly, each mapping unit in that series. Unless it is specifically mentioned otherwise, it is to be assumed that what is stated about the soil series holds true for the mapping units in that series. Thus, to get full information about any one mapping unit, it is necessary to read both the description of the mapping unit and the description of the soil series to which it belongs.

An important part of the description of each soil series is the soil profile, which is the sequence of layers from the surface downward to rock or other underlying material. Each series contains two descriptions of this profile. The first is brief and in terms familiar to the layman. The second is much more detailed and is for those who need to make thorough and precise studies of soils. The profile described in the series is representative for mapping units in that series. If the profile of a

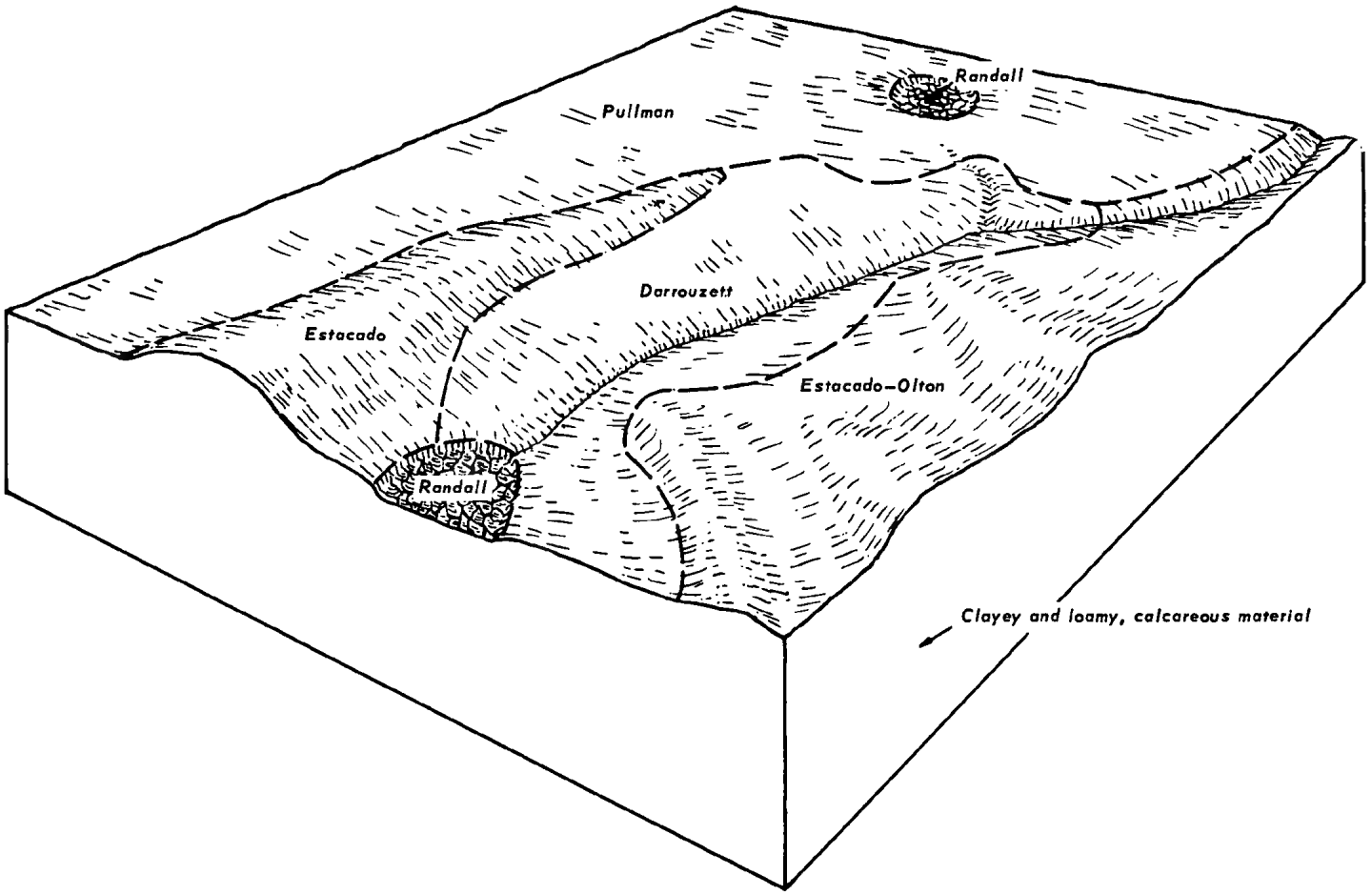

Figure 6.—**Pattern of soils and underlying material in association 5.**

given mapping unit is different from the one described for the series, these differences are stated in describing the mapping unit, or they are differences that are apparent in the name of the mapping unit. The color terms described are for dry soil unless otherwise stated.

Following the name of each mapping unit is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit is the capability unit and range site in which the mapping unit has been placed. The page for the description of each capability unit or range site can be learned by referring to the "Guide to Mapping Units."

The acreage and proportionate extent of each mapping unit are shown in table 1. Many of the terms used in describing soils can be found in the Glossary, and more detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual.[1]

Acuff Series

The Acuff series consists of deep, moderately permeable soils on uplands. These soils formed in calcareous, loamy material.

In a representative profile the surface layer is dark-brown loam about 5 inches thick. The next layer reaches to a depth of 85 inches. The upper 19 inches of this layer is reddish-brown clay loam (fig. 7); the next 16 inches is yellowish-red, calcareous clay loam; the next 15 inches is reddish-yellow sandy clay loam; and the lower 30 inches is light-brown sandy clay loam that is about 40 percent visible calcium carbonate in the upper part and 10 percent visible calcium carbonate in the lower part.

These soils are well drained. Available water capacity is high.

Representative profile of Acuff loam, 1 to 3 percent slopes, 1.2 miles north of Wolf Creek bridge on Texas Highway No. 23, then 50 feet west into field; about 15 miles south of Booker:

Ap—0 to 5 inches, dark-brown (7.5YR 4/2) loam, dark brown (7.5YR 3/2) moist; moderate, very fine, subangular blocky structure; hard, friable; many fine pores; many roots; common worm casts; neutral; abrupt, smooth boundary.

B21t—5 to 14 inches, reddish-brown (5YR 4/3) clay loam, dark reddish brown (5YR 3/3) moist; moderate, coarse, prismatic structure parting to moderate, very fine, subangular blocky; very hard, firm; common fine pores; common worm casts; few thin clay films on ped surfaces; neutral; clear, smooth boundary.

B22t—14 to 24 inches, reddish-brown (5YR 4/4) clay loam, dark reddish brown (5YR 3/4) moist; moderate, coarse, prismatic structure parting to weak, fine,

[1] UNITED STATES DEPARTMENT OF AGRICULTURE. SOIL SURVEY MANUAL. U.S. Dept. of Agr. Handbook No. 18, 503 pp., illus. 1951. [Supplement issued in 1962]

TABLE 1.—*Approximate acreage and proportionate extent of the soils*

Soil	Acres	Percent	Soil	Acres	Percent
Acuff loam, 1 to 3 percent slopes	19,160	3	Mansker loam, 1 to 3 percent slopes	5,920	1
Acuff loam, 3 to 5 percent slopes	18,830	3	Mobeetie fine sandy loam, 1 to 3 percent slopes	5,450	1
Altus fine sandy loam, 0 to 1 percent slopes	1,150	(1)	Mobeetie fine sandy loam, 3 to 5 percent slopes	16,200	3
Berda loam, 1 to 3 percent slopes	960	(1)	Mobeetie fine sandy loam, 5 to 8 percent slopes	21,370	4
Berda and Potter soils, rolling	48,400	8	Mobeetie-Potter association, rolling	35,790	6
Bippus clay loam, 0 to 1 percent slopes	3,530	(1)	Olton clay loam, 1 to 3 percent slopes	12,580	2
Bippus clay loam, 1 to 3 percent slopes	6,630	1	Olton clay loam, 3 to 5 percent slopes	15,030	3
Bippus fine sandy loam, 1 to 3 percent slopes	2,100	(1)	Paloduro loam, 0 to 1 percent slopes	490	(1)
Darrouzett silty clay loam, 0 to 1 percent slopes	6,280	1	Paloduro loam, 1 to 3 percent slopes	6,000	1
Darrouzett silty clay loam, 1 to 3 percent slopes	20,620	4	Paloduro loam, 3 to 5 percent slopes	1,230	(1)
Darrouzett silty clay loam, 3 to 5 percent slopes	3,380	(1)	Paloduro, Veal and Berda soils, rolling	26,640	5
Devol loamy fine sand, 3 to 8 percent slopes	54,140	9	Paloduro, Veal, and Portales soils, 3 to 5 percent slopes	61,600	12
Devol and Springer soils, undulating, severely eroded	1,570	(1)	Portales clay loam, 1 to 3 percent slopes	3,720	(1)
Estacado silty clay loam, 1 to 3 percent slopes	15,560	3	Potter soils, rolling	9,720	2
Estacado-Olton complex, 0 to 3 percent slopes	5,080	(1)	Pullman silty clay loam, 0 to 1 percent slopes	7,850	1
Grandfield fine sandy loam, 1 to 3 percent slopes	33,420	6	Pullman silty clay loam, 1 to 3 percent slopes	1,470	(1)
Grandfield fine sandy loam, 3 to 5 percent slopes	16,070	3	Randall clay	260	(1)
Guadalupe fine sandy loam	5,500	1	Springer loamy fine sand, 0 to 3 percent slopes	8,820	2
Likes loamy fine sand, undulating	19,860	3	Spur soils	5,220	1
Lincoln soils	8,030	1	Sweetwater soils	1,870	(1)
			Tipton loam, 0 to 1 percent slopes	1,830	(1)
			Tipton loam, 1 to 3 percent slopes	11,660	2
			Tivoli fine sand	28,380	5
			Veal loam, 1 to 3 percent slopes	12,230	2
			Veal loam, 3 to 5 percent slopes	6,160	1
			Total	597,760	100.0

[1] Less than 1 percent.

subangular blocky; very hard, firm; common fine and very fine pores; few worm casts; few thin clay films on ped surfaces; mildly alkaline; clear, smooth boundary.

B23t—24 to 40 inches, yellowish-red (5YR 5/6) clay loam, yellowish red (5YR 4/6) moist; moderate, coarse, prismatic structure parting to weak, fine, subangular blocky; very hard, friable; common medium to very fine pores; few worm casts; few thin clay films on ped surfaces; common threads and films of calcium carbonate on ped and pore surfaces; calcareous; moderately alkaline; clear, wavy boundary.

B24t—40 to 55 inches, reddish-yellow (5YR 6/6) sandy clay loam, yellowish red (5YR 4/6) moist; weak, coarse, prismatic structure parting to weak, fine, subangular blocky; very hard, friable; many medium to very fine pores; few worm casts; few thin clay films on ped surfaces; common threads and films of calcium carbonate; calcareous; moderately alkaline; diffuse, wavy boundary.

B25tca—55 to 75 inches, light-brown (7.5YR 6/4) sandy clay loam, brown (7.5YR 5/4) moist; weak, fine, subangular blocky structure; very hard, friable; few thin clay films on ped surfaces; about 40 percent visible calcium carbonate in threads and films and medium to very fine soft masses and concretions; calcareous; moderately alkaline; diffuse, wavy boundary.

B3—75 to 85 inches, light-brown (7.5YR 6/4) sandy clay loam, brown (7.5YR 5/4) moist; weak, fine, subangular blocky structure; few very fine pores; about 10 percent visible calcium carbonate in medium to very fine concretions; calcareous; moderately alkaline.

The A horizon is dark brown or dark grayish brown. It ranges from 5 to 14 inches in thickness. The Bt horizon is clay loam or sandy clay loam. The B21t horizon is dark brown, reddish brown, or dark grayish brown. The rest of the Bt horizon above the Btca horizon is reddish brown, brown, yellowish red, reddish yellow, or light brown. The profile becomes calcareous at a depth of 18 to 25 inches. The Btca horizon is pink, light brown, or reddish yellow and begins at a depth of 30 to 60 inches. It is 20 to 60 percent calcium carbonate. Below the Btca horizon the B horizon is red, yellowish red, reddish yellow, or light brown.

Acuff loam, 1 to 3 percent slopes (AcB).—This soil is in weakly convex areas on ridges and in weakly concave areas on undulating plains. These areas are irregularly shaped and are commonly less than 200 acres in size. The slope is dominantly about 1.8 percent.

This soil has the profile described as representative of the series.

Included with this soil in mapping are areas of Olton, Grandfield, Tipton, Mansker, Veal, and Portales soils. Also included are small areas of nearly level soils, areas of eroded soils, and areas of soils that have a light-colored surface layer.

This soil is used for range and crops. The hazards of water erosion and soil blowing are slight. Dryland capability unit IIIe-2, irrigated capability unit IIIe-2, Deep Hardland range site.

Acuff loam, 3 to 5 percent slopes (AcC).—This soil is in weakly concave and convex areas on hillsides and ridges. These areas are irregularly shaped and average about 20 acres in size. The slope is dominantly about 4 percent.

Typically, this soil has a surface layer of dark grayish-brown, friable loam about 7 inches thick. The next layer is clay loam. The upper 9 inches is reddish brown; the next 20 inches is brown and has a few threads and films of calcium carbonate; the next 16 inches is reddish-yellow and friable; and the lower part is pink and is about 40 percent calcium carbonate.

Included with this soil in mapping are areas of Olton, Grandfield, Mansker, Veal, Tipton, and Portales soils. Also included are small areas of sloping soils and a few areas of eroded soils that are cropped. The eroded

Figure 7.—**Profile of an Acuff loam that shows prismatic structure.**

soils make up about 10 percent of this mapping unit. Most of the erosion appears to have been caused by water. Shallow, crossable gullies as much as 18 inches deep and 30 to 100 feet apart are in the eroded areas. In some drainageways are deposits of soils that are as much as 3 feet deep and cover as much as 2 acres.

This soil is used for crops and range. The hazard of water erosion is moderate, and the hazard of soil blowing is slight. Dryland capability unit IVe-1, irrigated capability unit IIIe-6, Deep Hardland range site.

Altus Series

The Altus series consists of deep, moderately permeable soils on uplands. These soils formed in calcareous, loamy material.

In a representative profile the surface layer is dark grayish-brown fine sandy loam about 8 inches thick. The next layer extends to a depth of 80 inches. The upper 16 inches is dark grayish-brown sandy clay loam; the next 11 inches is brown, friable sandy clay loam; the next 33 inches is reddish-yellow, calcareous fine sandy loam; and the lower 12 inches is light-brown silty clay loam. The underlying material is reddish-yellow, calcareous fine sandy loam.

These soils are well drained. Available water capacity is medium.

Representative profile of Altus fine sandy loam, 0 to 1 percent slopes, 1 mile northwest of U.S. Highway No. 60 in Higgins on Texas Highway No. 213, then 4.7 miles north on a county road, then 50 feet west into a pasture:

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak, granular structure; slightly hard, very friable; neutral; abrupt, smooth boundary.

B21t—8 to 16 inches, dark grayish-brown (10YR 4/2) sandy clay loam, very dark grayish brown (10YR 3/2) moist; moderate, very coarse, prismatic structure parting to weak, fine, subangular blocky; very hard, friable; common fine pores; common worm casts; few thin clay films on ped surfaces; neutral; gradual, smooth boundary.

B22t—16 to 24 inches, dark grayish-brown (10YR 4/2) sandy clay loam, very dark grayish brown (10YR 3/2) moist; moderate, very coarse, prismatic structure parting to moderate, fine, subangular blocky; very hard, friable; common fine pores; few worm casts; few thin clay films on ped surfaces; mildly alkaline; gradual, smooth boundary.

B23t—24 to 35 inches, brown (7.5YR 5/2) sandy clay loam, brown (7.5YR 4/2) moist; moderate, very coarse, prismatic structure parting to weak, medium, subangular blocky; very hard, friable; few fine pores; few thin clay films on ped surfaces; mildly alkaline; diffuse, smooth boundary.

B3—35 to 68 inches, reddish-yellow (7.5YR 6/6) fine sandy loam, strong brown (7.5YR 5/6) moist; weak, very coarse, prismatic structure parting to weak, fine, subangular blocky; hard, very friable; common medium and fine pores; few quartz pebbles as much as ½ inch in diameter; few threads and films of calcium carbonate; calcareous, moderately alkaline; abrupt, smooth boundary.

IIB2t—68 to 80 inches, light-brown (7.5YR 6/4) silty clay loam, brown (7.5YR 5/4) moist; moderate, fine, blocky structure; extremely hard, very firm; few thin clay films on ped surfaces; few quartz pebbles as much as ¼ inch in diameter; few threads and films and very fine concretions of calcium carbonate; calcareous; moderately alkaline; abrupt, smooth boundary.

IIIC—80 to 85 inches, reddish-yellow (5YR 7/6) fine sandy loam, reddish yellow (5YR 6/6) moist; weak, medium, subangular blocky structure; slightly hard, very friable; few threads and films of calcium carbonate; calcareous; moderately alkaline.

The A horizon is brown or dark grayish brown. It ranges from 6 to 8 inches in thickness. The B21t and B22t horizons are dark brown or dark grayish brown. The B23t horizon is brown, dark brown, or reddish brown. A B3ca horizon is in a few places. The B3 and C horizons are reddish yellow, pale brown, or brown. They are fine sandy loam or sandy clay loam. In some places the dark buried horizon is absent.

Altus fine sand loam, 0 to 1 percent slopes (AlA).—This soil is in slightly concave and plane areas. The slope is dominantly about 0.6 percent. Most areas are oval.

Included with this soil in mapping are areas of Grandfield and Tipton soils. Also included are areas of

gently sloping soils and small areas of soils that are darkened to a depth of less than 20 inches.

Nearly all of this soil is cultivated. It receives some water from outside. The hazard of soil blowing is moderate. Dryland capability unit IIe-3, irrigated capability unit IIe-3, Sandy Loam range site.

Berda Series

The Berda series consists of deep, moderately permeable soils on uplands. These soils formed in calcareous, loamy material.

In a representative profile the surface layer is grayish-brown, calcareous loam about 9 inches thick. The next layer is friable loam that extends to a depth of about 48 inches. The upper 16 inches is brown, and the lower 23 inches is light brown and is about 3 percent visible calcium carbonate. The underlying material is light-brown, calcareous loam.

These soils are well drained. Available water capacity is high.

Representative profile of a Berda loam in an area of Berda and Potter soils, rolling, in a road cut 0.25 mile south of the Kiowa Creek bridge on Farm Road 2172, just southwest of Darrouzett:

A1—0 to 9 inches, grayish-brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; moderate, very fine, subangular blocky structure; hard, friable; common fine and very fine pores; common worm casts; few very fine caliche fragments; calcareous; moderately alkaline; gradual, smooth boundary.

B21—9 to 25 inches, brown (10YR 5/3) loam, brown (10YR 4/3) moist; weak, very coarse, prismatic structure parting to weak, fine, subangular blocky; hard, friable; many medium to very fine pores; many worm casts; few very fine caliche fragments; few threads and films of calcium carbonate; calcareous; moderately alkaline; gradual, smooth boundary.

B22ca—25 to 48 inches, light-brown (7.5YR 6/4) loam, brown (7.5YR 5/4) moist; weak, very coarse, prismatic structure parting to weak, fine, subangular blocky; hard, friable; common medium and fine pores; few worm casts; about 3 percent very fine, soft masses and concretions of calcium carbonate; calcareous; moderately alkaline; diffuse, smooth boundary.

C—48 to 70 inches, light-brown (7.5YR 6/4) loam, brown (7.5YR 5/4) moist; massive; hard, friable; few fine pores; few films and threads and very fine concretions of calcium carbonate; calcareous; moderately alkaline.

The A horizon is grayish brown or brown. It ranges from 6 to 14 inches in thickness and is loam or clay loam. The B21 horizon is brown, light brown, grayish brown, or light brownish gray, and ranges from 10 to 24 inches in thickness. The B22ca horizon is light yellowish brown, light brown, pale brown, brown, or pink. Depth to this horizon ranges from 21 to 38 inches. This horizon is 2 to 10 percent visible calcium carbonate. The B22ca horizon is absent in some places. The C horizon is brown, reddish brown, light brown, or light reddish brown. A buried layer of brownish, calcareous silty clay loam is in some places below a depth of 40 inches.

The delineations in unit BeD are much larger and the composition is more variable than in other mapping units in the county. Mapping has been controlled well enough, however, for the anticipated use of the soils.

Berda loam, 1 to 3 percent slopes (BdB).—This soil is in plane or convex areas on plains and foot slopes. The slope is dominantly about 2 percent. The areas are irregular in shape.

Typically, this soil has a surface layer of grayish-brown, friable, calcareous loam about 8 inches thick. The next layer is brown, friable clay loam in the upper 20 inches and brown clay loam that contains about 2 percent threads, films, and very fine, soft masses of calcium carbonate in the lower 25 inches. The underlying material is light-brown silty clay loam.

Included with this soil in mapping are areas of Mobeetie, Paloduro, Mansker, Veal, Portales, Tipton, and Acuff soils and a soil similar to this Berda soil but noncalcareous in the surface layer. Also included are areas of soils that are brownish, blocky silty clay loam above a depth of 40 inches.

This soil is used for range and crops. The hazard of soil blowing is slight. The hazard of water erosion is moderate. Dryland capability unit IIIe-2, irrigated capability unit IIIe-2, Hardland Slopes range site.

Berda and Potter soils, rolling (BeD).—These soils are in areas below the High Plains (fig. 8). These areas are irregularly shaped and range from about 20 acres to more than 500 acres in size. The slope ranges from 5 to 12 percent and is dominantly about 10 percent. Escarpments caused by erosion are advancing up some of the drainageways and leave U-shaped gullies.

About 38 percent of this mapping unit is Berda soils; 30 percent is Potter soils; and 32 percent is areas of Veal soils, Mansker soils, rock land, soils that are less than 10 inches thick over rock, and other soils. The percentage of each soil varies from area to area. Berda soils make up 20 to 55 percent of areas of the mapping unit, and Potter soils make up 10 to 35 percent. Berda soils are in plane and convex areas below Potter soils. Potter soils are on knolls and ridges.

A Berda soil in this mapping unit has the profile described as representative for the Berda series.

The Potter soils have a surface layer that is grayish-brown, calcareous loam in the upper 3 inches and grayish-brown gravelly loam that has about 35 percent caliche fragments that are as much as 3 inches in diameter in the lower 5 inches. The underlying material is pale-brown, fractured, platy caliche that has bright pendants of accumulated calcium carbonate on the undersides in the upper 6 inches, and pink, fractured caliche below.

Included with these soils in mapping are areas of Mobeetie and Paloduro soils. Also included are small areas of rough broken land along escarpments and areas of Spur soils along drainageways.

These soils are used for range and for wildlife habitat. Most of the rainfall runs off before it soaks into the soils. The hazard of water erosion is high. Berda soils are in Dryland capability unit VIe-2, Hardland Slopes range site; Potter soils are in Dryland capability unit VIIs-1, Very Shallow range site.

Bippus Series

The Bippus series consists of deep, moderately permeable soils on uplands. These soils formed in calcareous, loamy material.

In a representative profile the surface layer is very dark grayish-brown, friable clay loam about 24 inches

Figure 8.—Area of Berda and Potter soils, rolling.

thick. The next layer, extending to a depth of 66 inches, is dark-brown clay loam that has threads and films of calcium carbonate in the upper part and about 3 percent visible calcium carbonate in the lower part (fig. 9).

These soils mostly receive runoff water from higher lying soils. Bippus soils are well drained. Available water capacity is high.

Representative profile of Bippus clay loam, 0 to 1 percent slopes, in range, 2.25 miles west of the Oklahoma State line on Texas Highway No. 15, then 0.4 mile north and northwest on a ranch road:

A11—0 to 12 inches, very dark grayish-brown (10YR 3/2) clay loam, very dark brown (10YR 2/2) moist; moderate, coarse, prismatic structure parting to moderate, fine, subangular blocky; very hard, friable; many medium and fine pores; many worm casts; mildly alkaline; clear, smooth boundary.

A12—12 to 24 inches, very dark grayish-brown (10YR 3/2) clay loam, very dark brown (10YR 2/2) moist; moderate, very coarse, prismatic structure parting to moderate, very fine, subangular blocky; very hard, friable; many fine pores; many worm casts; calcareous; moderately alkaline; gradual, smooth boundary.

B21ca—24 to 48 inches, dark-brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; moderate, medium, prismatic structure parting to moderate, fine, subangular blocky; very hard, friable; common films and threads of calcium carbonate; calcareous; moderately alkaline; diffuse, smooth boundary.

B22ca—48 to 66 inches, dark-brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; weak, fine, subangular blocky structure; hard, friable; about 3 percent, by volume, calcium carbonate as common threads and films and few, very fine, soft masses; calcareous; moderately alkaline.

The A horizon is dark brown, very dark grayish brown, or dark grayish brown. It ranges from 12 to 24 inches in thickness and is fine sandy loam or clay loam. The B21ca horizon is brown, grayish brown, dark grayish brown, or dark brown. The B22ca horizon is dark brown, pale brown, brown, light brown, or very pale brown. Visible calcium carbonate in the B22ca horizon is less than 5 percent. The B22ca horizon is absent in about 10 percent of the area. The B2 horizon is clay loam or sandy clay loam.

Bippus clay loam, 0 to 1 percent slopes (BrA).—This soil is in plane and concave areas along streams on the valley floors. It is in areas of old alluvium and on benchlike foot slopes that still receive some runoff water. Areas of this soil are elongated and parallel drainageways. The slope is dominantly about 0.4 percent.

This soil has the profile described as representative of the Bippus series.

Included with this soil in mapping are areas of Spur, Guadalupe, Paloduro, and Tipton soils. Also included are small areas of Bippus clay loam, 1 to 3 percent slopes, and of soils that have a surface layer of fine sandy loam.

This soil is used for range and crops. Some areas of this soil are impractical to use for crops, because they are too small or inaccessible. The hazard of soil blowing is slight. Dryland capability unit IIe-1, irrigated capability unit I-2, Deep Hardland range site.

Bippus clay loam, 1 to 3 percent slopes (BrB).—This soil is in plane and concave areas on foot slopes and alluvial fans. These areas average about 25 acres in size, but some areas are as large as 100 acres. The slope is dominantly about 1.7 percent.

This soil has a surface layer of very dark grayish-brown, friable clay loam about 12 inches thick. The next layer is dark grayish-brown, friable clay loam

Figure 9.—**Profile of a Bippus clay loam.**

in the upper 11 inches; grayish-brown, calcareous clay loam in the next 11 inches; and brown clay loam that contains threads and films of calcium carbonate in the lower 29 inches. The underlying material is pale-brown clay loam that is about 2 percent threads and films and very fine, soft masses of calcium carbonate.

Included with this soil in mapping are areas of Spur, Guadalupe, Tipton, and Paloduro soils. Also included are small areas of soils that have a surface layer of fine sandy loam and small areas of nearly level soils.

This soil is used for crops and range. The hazard of soil blowing is slight. The hazard of water erosion is moderate. Dryland capability unit IIIe-2, irrigated capability unit IIe-2, Deep Hardland range site.

Bippus fine sandy loam, 1 to 3 percent slopes (BuB).—This soil is in concave and plane areas on alluvial fans, in broad drainageways, and on foot slopes. Areas of this soil average about 40 acres in size. The slope is dominantly about 1.6 percent. Some scouring and deposition of fresh alluvium are evident along drainageways. Stream channels have been cut at the edge of some areas of this soil.

This soil has a surface layer of dark grayish-brown fine sandy loam about 24 inches thick. The next layer is grayish-brown, calcareous clay loam in the upper 21 inches and brown, friable clay loam that contains threads and films of calcium carbonate below.

Included with this soil in mapping are areas of Spur, Guadalupe, and Paloduro soils. Also included are areas of soils that have a surface layer of clay loam, meandering stream channels, and some areas of nearly level Bippus soils.

This soil is used mostly for range. Some areas of this soil are used for crops. The hazard of soil blowing is moderate, and the hazard of water erosion is slight. Dryland capability unit IIIe-4, irrigated capability unit IIIe-3, Sandy Loam range site.

Darrouzett Series

The Darrouzett series consists of deep, moderately slowly permeable soils on uplands. These soils formed in calcareous, loamy material.

In a representative profile the surface layer is grayish-brown silty clay loam about 6 inches thick. The next layer extends to a depth of 100 inches. The upper 17 inches is dark grayish-brown silty clay loam (fig. 10); the next 32 inches is dark-brown to brown, firm, calcareous silty clay loam; the next 20 inches is strong-brown clay loam that contains a few soft masses of calcium carbonate; and the lower 25 inches is pink silty clay loam.

These soils are well drained. Available water capacity is high.

Representative profile of Darrouzett silty clay loam, 1 to 3 percent slopes, 0.5 mile west of the intersection of Farm Road 2172 and Texas Highway No. 15 in Darrouzett, then 40 feet south into a cultivated field:

Ap—0 to 6 inches, grayish-brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak, very fine, granular structure; hard, friable, sticky; neutral; abrupt, smooth boundary.

B21t—6 to 14 inches, dark grayish-brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate, fine and medium, blocky structure; very hard, very firm, sticky; common fine and very fine pores; few worm casts; few thin clay films; neutral; clear, smooth boundary.

B22t—14 to 23 inches, dark grayish-brown (10YR 4/2) silty clay loam, dark brown (10YR 3/3) moist; moderate, medium, blocky structure; very hard, firm, sticky; common very fine pores; few worm casts; continuous clay films on ped surfaces; mildly alkaline; gradual, smooth boundary.

B23t—23 to 35 inches, dark-brown (10YR 4/3) silty clay loam, dark brown (10YR 3/3) moist; weak, medium and coarse, blocky structure; very hard, firm, sticky; few very fine pores; few worm casts; continuous clay films on ped surfaces; few, very fine, soft masses, threads, and films of calcium carbonate; calcareous; moderately alkaline; gradual, smooth boundary.

B24t—35 to 55 inches, brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; weak, coarse, prismatic structure parting to weak, medium, blocky; very hard, firm, sticky; common medium to very fine pores; few worm casts; clay films on ped surfaces; about 2 percent visible calcium carbonate as very fine, soft masses, threads, and films;

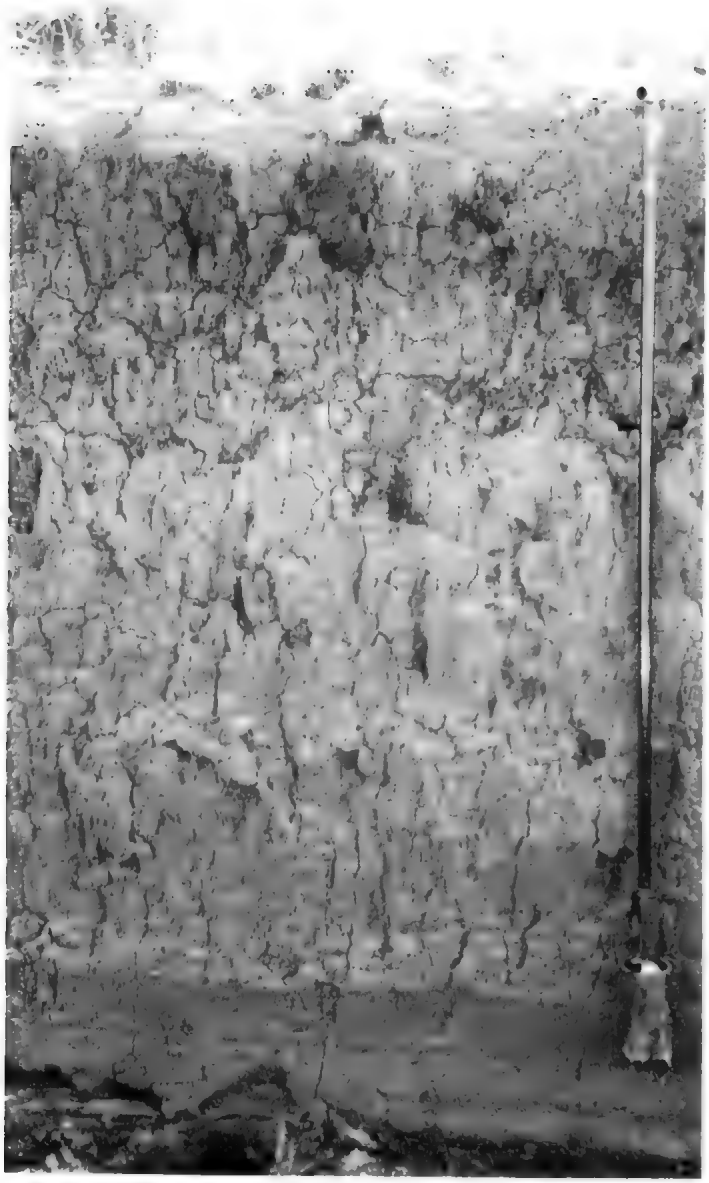

Figure 10.—**Profile of a Darrouzett silty clay loam.**

calcareous; moderately alkaline; gradual, smooth boundary.

B25t—55 to 75 inches, strong-brown (7.5YR 5/6) clay loam, strong brown (7.5YR 4/6) moist; weak, coarse, prismatic structure parting to weak, fine, blocky; very hard, firm, sticky; common fine and very fine pores; continuous clay films on ped surfaces; about 2 percent, by volume, visible calcium carbonate as few, very fine, soft masses and concretions as much as 1 centimeter in diameter; calcareous; moderately alkaline; clear, wavy boundary.

B26tca—75 to 90 inches, pink (7.5YR 8/4) silty clay loam, pink (7.5YR 7/4) moist; weak, medium, subangular blocky structure; very hard, friable; many medium to very fine pores; few thin clay films; 30 percent visible calcium carbonate as soft masses and concretions as much as 2 centimeters in diameter; calcareous; moderately alkaline; gradual wavy boundary.

B27tca—90 to 100 inches, pink (7.5YR 7/4) silty clay loam, light brown (7.5YR 6/4) moist; weak, medium, subangular blocky structure; very hard, friable; common fine and very fine pores; few thin clay films; 15 percent visible calcium carbonate as soft masses and concretions as much as 1 centimeter in diameter; calcareous; moderately alkaline.

The solum is more than 80 inches thick. The combined thickness of the layers of dark-colored material in the upper part of the profile ranges from 20 to 36 inches. Accumulated calcium carbonate is at a depth of 15 to 28 inches. A calcium carbonate horizon is at a depth of 50 to 80 inches.

The A horizon is brown, grayish brown, or dark grayish brown and ranges from 4 to 12 inches in thickness. It is neutral to moderately alkaline. The Bt horizon is clay loam, silty clay loam, or clay and is 35 to 43 percent clay. The B21t and B22t horizons are dark brown or dark grayish brown; the B23t and B24t horizons are reddish brown, brown, or dark brown; and the B25t and Btca horizons are pink, light reddish brown, reddish brown, reddish yellow, yellowish red, or strong brown. The Btca horizon is 15 to 60 percent calcium carbonate, mostly soft and powdery.

Darrouzett silty clay loam, 0 to 1 percent slopes (DaA). This soil is in plane, weakly concave, or convex areas. These areas have smooth boundaries and are oval or oblong. The slope is dominantly about 0.5 percent.

This soil has a plow layer of dark grayish-brown, neutral silty clay loam about 6 inches thick. The next layer extends to a depth of 86 inches. In sequence from the top, it is 9 inches of dark grayish-brown silty clay loam; 31 inches of dark-brown to brown silty clay loam; 20 inches of light reddish-brown clay loam; 12 inches of pink clay loam that is about 20 percent visible calcium carbonate; and 8 inches of reddish-yellow clay loam that is about 8 percent visible calcium carbonate. The underlying material is reddish-yellow clay loam that is about 30 percent visible calcium carbonate.

Included with this soil in mapping are areas of Pullman, Olton, Tipton, Mansker, Randall, and Estacado soils. Also included are small areas of gently sloping soils.

Most areas of this soil are used for crops, and some of these are irrigated. A few areas are still used for range. The hazard of soil blowing is slight. Dryland capability unit IIIe-3, irrigated capability unit I-1, Deep Hardland range site.

Darrouzett silty clay loam, 1 to 3 percent slopes (DaB). —This soil is in plane, convex, or concave areas along ridges and drainageways. These areas are elongated. The slope is dominantly about 2 percent.

This soil has the profile described as representative of the Darrouzett series.

Included with this soil in mapping are areas of Pullman, Olton, Mansker, Estacado, and Spur soils. Also included are small areas of soils that have slopes of less than 1 percent.

Most areas of this soil are used for crops, but a few areas are used for range. The hazard of soil blowing is slight, and the hazard of water erosion is moderate. Dryland capability unit IIIe-2, irrigated capability unit IIe-1, Deep Hardland range site.

Darrouzett silty clay loam, 3 to 5 percent slopes (DaC). —This soil is in plane to weakly concave areas. These areas average about 40 acres in size, are elongated, and are along drainageways. The slope is dominantly about 4 percent (fig. 11).

Figure 11.—**Terraces on Darrouzett silty clay loam, 3 to 5 percent slopes.**

This soil has a plow layer of grayish-brown silty clay loam about 4 inches thick. The next layer is 69 inches thick. The upper 8 inches is dark grayish-brown silty clay loam, the next 34 inches is dark-brown to brown silty clay loam, and the lower 27 inches is yellowish-red clay loam. The underlying material is pink clay loam that is about 25 percent visible calcium carbonate.

Included with this soil in mapping are areas of Olton, Estacado, Mansker, Veal, Bippus, and Spur soils. Also included are small areas of eroded soils.

This soil is used for crops and range. Runoff is rapid during the heavier rains. The hazard of water erosion is high, and the hazard of soil blowing is slight. Dryland capability unit IVe-6, Deep Hardland range site.

Devol Series

The Devol series consists of deep, moderately rapidly permeable soils on uplands. These soils formed in sandy eolian and outwash materials.

In a representative profile the surface layer is brown, neutral loamy fine sand about 10 inches thick. The next layer is 35 inches thick. The upper 14 inches is brown fine sandy loam, and the lower 21 inches is brown, very friable loamy fine sand. The underlying material is light-brown, loose loamy fine sand that is calcareous in the upper part (fig. 12).

These soils are well drained. Available water capacity is low.

Representative profile of Devol loamy fine sand, 3 to 8 percent slopes, 2.15 miles north of the Wolf Creek bridge on Farm Road 1454, and 40 feet west into range; about one-half mile east and 10 miles south of Follett:

A1—0 to 10 inches, brown (10YR 5/3) loamy fine sand, brown (10YR 4/3) moist; weak, very fine, subangular blocky structure; slightly hard, very friable; many roots; few worm casts; neutral; clear, smooth boundary.

B2t—10 to 24 inches, brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; weak, coarse, prismatic structure parting to weak, very fine, subangular blocky; slightly hard, very friable; common roots; few worm casts; neutral; diffuse, smooth boundary.

B3—24 to 45 inches, brown (7.5YR 5/4) loamy fine sand, brown (7.5YR 4/4) moist; weak, coarse, prismatic structure; slightly hard, very friable; few worm casts; mildly alkaline; diffuse, smooth boundary.

C—45 to 85 inches, light-brown (7.5YR 6/4) loamy fine sand, brown (7.5YR 5/4) moist; single grained; loose; few threads and films of calcium carbonate to a depth of 65 inches; calcareous; moderately alkaline.

The A horizon is brown or light brown. It ranges from 7 to 14 inches in thickness. The B2t and B3 horizons are brown, light brown, yellowish red, or reddish yellow. The B3 horizon is loamy fine sand or fine sandy loam. The fine sandy loam ranges from 10 to 30 inches in thickness. Depth to the C horizon ranges from 30 to 60 inches. The C horizon is brown or light brown. The C horizon is noncalcareous below a depth of 40 inches in about 65 percent of the area.

Devol loamy fine sand, 3 to 8 percent slopes (DeD).—This soil is on ridges and hillsides. The slope is dominantly about 6 percent. The soil is gently undulating or gently rolling.

This soil has the profile described as representative of the Devol series.

Included with this soil in mapping are areas of Springer, Mobeetie, Grandfield, Likes, Veal, and Tivoli soils. Also included are small playas and small areas of eroded soils.

This soil is used almost entirely for range. Because this soil is sandy, most of the rainfall soaks into the ground and little runs off. The hazard of soil blowing is high. Dryland capability unit VIe-1, Sandyland range site.

Figure 12.—**Profile of a Devol loamy fine sand.**

Devol and Springer soils, undulating, severely eroded (DsC3).—These soils are on ridges and hillsides (fig. 13). Areas of these soils are generally less than 40 acres in size, but a few areas are as large as 150 acres. The areas are not uniform, and they occur without regularity. The slope is dominantly about 4 percent.

This mapping unit is about 50 percent Devol soils, 30 percent Springer soils, and 20 percent included soils. All of the loamy fine sand surface layer has been removed from about 60 percent of the acreage of these soils. About 30 percent of most areas is sand dunes. There are also blowout pits that average about 75 feet across, are about 150 feet long, range from 4 to 12 feet in depth, and are eroded into the C horizon. These areas have very thin stands of grasses. Sand dunes as much as 5 feet high are on one or more sides of the blowout pits. A few gullies are in most areas of these soils. About 10 percent of most areas is not eroded.

The Devol soils have a surface layer of brown, loose loamy fine sand about 7 inches thick. The next layer is brown fine sandy loam in the upper 15 inches and light-brown loamy fine sand in the lower 20 inches. The underlying material is brown loamy fine sand.

The Springer soils have a surface layer of brown loamy fine sand about 8 inches thick. The next layer is brown fine sandy loam in the upper 10 inches, strong-brown fine sandy loam in the next 24 inches, and light-brown loamy fine sand in the lower 20 inches. The underlying material is reddish-yellow fine sandy loam.

Most areas of these soils were at one time used for crops, but they have been left idle or reseeded to grass. Some of them are slowly becoming covered with grass. The hazard of soil blowing is high. Dryland capability unit VIIe-1, Sandyland range site.

Estacado Series

The Estacado series consists of deep, moderately permeable soils on uplands. These soils formed in calcareous, loamy material.

In a representative profile the surface layer is dark grayish-brown, calcareous silty clay loam about 13 inches thick. The next layer is clay loam that extends to a depth of 90 inches. The upper 29 inches is light brown and is about 20 percent visible calcium carbonate in the lower part; the next 10 inches is reddish yellow and is about 10 percent visible calcium carbonate; the next 23 inches is light brown and is 20 percent visible calcium carbonate; and the lower 15 inches is reddish yellow and is about 15 percent visible calcium carbonate.

These soils are well drained. Available water capacity is high.

Representative profile of Estacado silty clay loam, 1 to 3 percent slopes, 6 miles south of Darrouzett on Farm Road 2172, then 4 miles west and 1 mile south on county roads, then 250 feet west and 50 feet south into a field; 250 feet west and 50 feet south of the northeast corner of sec. 903:

Ap—0 to 4 inches, dark grayish-brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak, very fine, subangular blocky structure; hard, friable; few fine and very fine pores; few worm casts; calcareous; moderately alkaline; abrupt, smooth boundary.

A1—4 to 13 inches, dark grayish-brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate, very fine, subangular blocky structure; hard, friable; many fine and very fine pores; many worm casts; calcareous; moderately alkaline; clear, smooth boundary.

B21t—13 to 23 inches, light-brown (7.5YR 6/4) clay loam, brown (7.5YR 5/4) moist; moderate, very coarse,

Figure 13.—**Area of Devol and Springer soils, undulating, severely eroded.**

prismatic structure parting to moderate, very fine, subangular blocky; very hard, friable; common fine and very fine pores; common worm casts; few threads and films of calcium carbonate on ped surfaces; few very fine calcium carbonate fragments; calcareous; moderately alkaline; clear, smooth boundary.

B22tca—23 to 42 inches, light-brown (7.5YR 6/4) clay loam, brown (7.5YR 5/4) moist; weak, coarse, prismatic structure parting to moderate, very fine, blocky; very hard, firm; common very fine pores; few clay films; about 20 percent visible calcium carbonate as fine and very fine, soft masses; calcareous; moderately alkaline; clear, smooth boundary.

B23tca—42 to 52 inches, reddish-yellow (7.5YR 6/6) clay loam, strong brown (7.5YR 5/6) moist; moderate, fine, blocky structure; very hard, firm; common fine pores; clay films on ped surfaces; few very fine ferrous manganese stains on ped surfaces; 10 percent visible calcium carbonate as fine and very fine, soft masses and concretions; calcareous; moderately alkaline; clear, wavy boundary.

B24tca—52 to 75 inches, light-brown (7.5YR 6/4) clay loam, brown (7.5YR 5/4) moist; moderate, medium and fine, blocky structure; very hard, firm; common very fine pores; few clay films on ped surfaces; few ferrous manganese stains on ped surfaces; about 20 percent visible calcium carbonate as common, medium to very fine concretions and soft masses; calcareous; moderately alkaline; clear, wavy boundary.

B25tca—75 to 90 inches, reddish-yellow (5YR 6/6) clay loam, yellowish red (5YR 5/6) moist; moderate, medium and fine, blocky structure; very hard, firm; clay films on ped surfaces; few ferrous manganese stains on ped surfaces; 15 percent visible calcium carbonate as fine and very fine, soft masses and concretions; calcareous; moderately alkaline.

The A horizon is brown, dark brown, grayish brown, or dark grayish brown. It ranges from 7 to 14 inches in thickness and is silty clay loam or clay loam. The B21t horizon above the horizon of calcium carbonate accumulation is brown, grayish brown, or light brown. Depth to the B22tca horizon ranges from 15 to 30 inches. The Bt horizon is clay loam or silty clay loam. The Btca and lower horizons are pink, reddish yellow, yellowish red, brown, light yellowish brown, light brown, strong brown, pale brown, or very pale brown. The Btca horizon is 10 to 50 percent visible calcium carbonate.

Estacado silty clay loam, 1 to 3 percent slopes (EsB).—This soil is in convex and plane areas that average about 50 acres in size. The slope is dominantly about 2.0 percent.

This soil has the profile described as representative of the Estacado series.

Included with this soil in mapping are areas of Olton, Pullman, Mansker, Tipton, Bippus, and Darrouzett soils. Also included are small areas of nearly level soils; small areas of soils that have slopes of more than 3 percent; a few areas of soils that have a noncalcareous surface layer; and a few areas of soils that are darkened to a depth of less than 10 inches.

This soil is used mostly for crops. A few areas of this soil are irrigated, and a few areas are still used for range. The hazard of soil blowing is slight, and the hazard of water erosion is moderate. Dryland capability unit IIIe-2, irrigated capability unit IIIe-2, Hardland Slopes range site.

Estacado-Olton complex, 0 to 3 percent slopes (EtB).—The soils of this complex are undulating. They are in irregularly shaped areas that range from 10 to 500

acres in size. The slope is dominantly about 1.5 percent.

About 50 percent of this unit is Estacado silty clay loam, 30 percent is Olton clay loam, and 20 percent is other soils. These soils are so intermingled that they cannot be shown separately at the scale mapped. In this complex Estacado soils range from 30 to 65 percent and Olton soils from 20 to 60 percent. Estacado soils are gently sloping and are on low, convex mounds. Olton soils are in plane and concave areas between the Estacado soils.

The Estacado soils have a plow layer of brown, calcareous silty clay loam about 6 inches thick. The next layer is dark grayish-brown silty clay loam in the upper 7 inches, brown clay loam in the next 9 inches, and light yellowish-brown clay loam in the lower 14 inches. The underlying material is reddish-yellow clay loam.

The Olton soils have a surface layer of dark-brown silty clay loam about 6 inches thick. The next layer is dark reddish-brown clay loam in the upper 10 inches, brown, calcareous clay loam in the next 24 inches, and light-brown clay loam that is about 20 percent visible calcium carbonate below. The underlying material is reddish-yellow clay loam that is about 5 percent visible calcium carbonate.

Included with these soils in mapping are Darrouzett soils in the concave areas and Mansker soils on the mounds.

These soils are mostly used for crops. The soils are difficult to manage because they are so intermingled. A few areas of these soils are used as range. The hazard of soil blowing is slight. The hazard of water erosion is moderate where the soils are gently sloping. Dryland capability unit IIIe-2, irrigated capability unit IIIe-2, Hardland Slopes range site.

Grandfield Series

The Grandfield series consists of deep, moderately permeable soils on uplands. These soils formed in calcareous sandy and loamy material.

In a representative profile the surface layer is brown fine sandy loam about 8 inches thick. The next layer is friable sandy clay loam and extends to a depth of 46 inches. The upper 26 inches is brown, and the lower 12 inches is light brown. The underlying material is reddish-yellow fine sandy loam that contains a few threads and films of calcium carbonate.

These soils are well drained. Available water capacity is medium.

Representative profile of Grandfield fine sandy loam, 1 to 3 percent slopes, in a cultivated field 4.4 miles north of Texas Highway No. 213 on a county road from the northwest corner of Higgins townsite, then 40 feet west; 0.4 mile north and 40 feet west of the southeast corner of sec. 443:

Ap—0 to 8 inches, brown (7.5YR 4/4) fine sandy loam, dark brown (7.5YR 3/4) moist; weak, granular structure; slightly hard, very friable; few quartz pebbles as much as ½ inch in diameter; neutral; abrupt, smooth boundary.

B21t—8 to 16 inches, brown (7.5YR 4/4) sandy clay loam, dark brown (7.5YR 3/4) moist; moderate, very coarse, prismatic structure parting to weak, fine, subangular blocky; very hard, friable; common medium and fine pores; common worm casts; few very fine and fine quartz pebbles; few thin clay films on ped surfaces; neutral; gradual, smooth boundary.

B22t—16 to 34 inches, brown (7.5YR 5/4) sandy clay loam, brown (7.5YR 4/4) moist; moderate, very coarse, prismatic structure parting to weak, medium, subangular blocky; very hard, friable; common medium and fine pores; few worm casts; few fine and very fine quartz pebbles; few thin clay films on ped surfaces; neutral; diffuse, smooth boundary.

B3—34 to 46 inches, light-brown (7.5YR 6/4) sandy clay loam, brown (7.5YR 5/4) moist; weak, very coarse, prismatic structure parting to weak, medium, subangular blocky; very hard, friable; few fine and very fine quartz pebbles; mildly alkaline; diffuse, wavy boundary.

C—46 to 72 inches, reddish-yellow (7.5YR 6/6) fine sandy loam, strong brown (7.5YR 5/6) moist; massive; slightly hard, very friable; few threads and films of calcium carbonate; calcareous; moderately alkaline.

The A horizon is brown or dark brown. It ranges from 5 to 16 inches in thickness. The Bt horizon is reddish brown, brown, dark brown, or light brown. It is sandy clay loam or fine sandy loam. The B3 horizon is brown, reddish brown, reddish yellow, or light brown. It is fine sandy loam or sandy clay loam. Depth to the C horizon ranges from 35 to 60 inches. It is reddish yellow, light brown, yellowish red, yellowish brown, very pale brown, pink, strong brown, or light yellowish brown. This horizon is loamy fine sand or fine sandy loam. Buried layers of sandy clay loam or clay loam are below a depth of 50 inches in a few places. They are brown, yellowish brown, pale brown, dark brown, or dark grayish brown.

The soils of this series in Lipscomb County are outside the range defined for the Grandfield series because the B horizon is mostly 7.5YR in hue. The Grandfield series is restricted to soils 5YR or redder in hue. Use, management, and behavior of these soils are similar to those of Grandfield soils.

Grandfield fine sandy loam, 1 to 3 percent slopes (GrB).—This soil is on weakly undulating plains. Areas average about 100 acres in size. The slope is dominantly about 1.8 percent. Most cropped areas of this soil are slightly eroded. Soil blowing has caused some sand to accumulate at field borders.

This soil has the profile described as representative of the Grandfield series.

Included with this soil in mapping are areas of Portales, Acuff, Veal, Mobeetie, Tipton, and Altus soils. Also included are a few areas of nearly level soils, areas of soils that have slopes of more than 3 percent, and a few areas of soils that have a surface layer of loamy fine sand.

This soil is used for crops and range. A few areas are irrigated. The hazard of water erosion is slight, and the hazard of soil blowing is moderate. Dryland capability unit IIIe-4, irrigated capability unit IIIe-3, Sandy Loam range site.

Grandfield fine sandy loam, 3 to 5 percent slopes (GrC).—This soil is on hillsides and ridges. Areas average about 40 acres in size and are irregularly shaped. The slope is dominantly about 4 percent. Most cropped areas are slightly eroded. Some sand has accumulated at most field borders. There are some rills and shallow gullies where water has concentrated and run off.

Typically, this soil has a surface layer of brown, very friable fine sandy loam about 5 inches thick. The next layer is brown sandy clay loam in the upper 13 inches; brown sandy clay loam in the next 18 inches; and

reddish-yellow, very friable fine sandy loam in the lower 12 inches. The underlying material is very pale brown loamy fine sand.

Included with this soil in mapping are areas of Acuff, Mobeetie, Devol, Veal, and Portales soils. Also included are small areas of soils that have slopes of less than 3 percent, small areas of sloping soils, and areas of eroded soils.

This soil is used for range and for crops. A few areas are irrigated. Because of the slope, most of the water runs off during the heavier rains. The hazards of soil blowing and water erosion are moderate. Dryland capability unit IIIe-8, irrigated capability unit IIIe-7, Sandy Loam range site.

Guadalupe Series

The Guadalupe series consists of deep, moderately rapidly permeable soils on bottom lands. These soils formed in loamy, calcareous, recent alluvial sediment underlain by sandier sediment.

In a representative profile the surface layer is brown, calcareous fine sandy loam and loam about 9 inches thick. The next layer extends to a depth of 32 inches. The upper 2 inches is very pale brown, very friable loamy fine sand; the next 7 inches is grayish-brown, friable clay loam; and the lower 14 inches is pale-brown, stratified fine sandy loam. The underlying material, extending to a depth of more than 60 inches, is mainly very pale brown loamy fine sand, fine sandy loam, and sand.

These soils are well drained. Available water capacity is medium.

Representative profile of Guadalupe fine sandy loam in range, 1.0 mile west on a county road from Texas Highway No. 305 in the southwest corner of Lipscomb townsite, then 0.4 mile north; southwest of the junction of Wolf and Sand Creeks:

A11—0 to 3 inches, brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; weak, fine, granular structure; slightly hard, very friable; calcareous; moderately alkaline; abrupt, smooth boundary.

A12—3 to 9 inches, brown (10YR 5/3) loam, brown (10YR 4/3) moist; weak, medium, prismatic structure parting to weak, fine, subangular blocky; very hard, friable; many medium to very fine pores; common worm casts; prominent stratification visible; upper 1 inch is 1 darker in value than rest of horizon; calcareous; moderately alkaline; abrupt, smooth boundary.

B21—9 to 11 inches, very pale brown (10YR 7/3) loamy fine sand, pale brown (10YR 6/3) moist; weak, fine, granular structure; slightly hard, very friable; few worm casts; calcareous; moderately alkaline; abrupt, smooth boundary.

B22—11 to 18 inches, grayish-brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; weak, medium, prismatic structure parting to weak, very fine, subangular blocky; very hard, friable; many pores; many worm casts; few threads and films of calcium carbonate; calcareous; moderately alkaline; clear, smooth boundary.

B23—18 to 32 inches, pale-brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; weak, coarse, prismatic structure parting to weak, fine, subangular blocky; hard, friable; common pores; common worm casts; faint stratification visible; few threads and films of calcium carbonate; calcareous; moderately alkaline; clear, smooth boundary.

C1—32 to 40 inches, very pale brown (10YR 7/3) loamy fine sand, light yellowish brown (10YR 6/4) moist; single grained; loose; few calcium carbonate concretions as much as 2 millimeters in diameter; calcareous; moderately alkaline; abrupt, smooth boundary.

C2—40 to 45 inches, pale-brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; weak, fine, subangular blocky structure; slightly hard, friable; few pores; few calcium carbonate concretions as much as 2 millimeters in diameter; calcareous; moderately alkaline; abrupt, smooth boundary.

C3—45 to 66 inches, very pale brown (10YR 8/4) sand, very pale brown (10YR 7/4) moist; single grained; loose; stratified with layers of different sizes of sand particles; faint mottling below a depth of 60 inches; saturated with water below a depth of 60 inches; calcareous; moderately alkaline.

The A horizon is brown, grayish brown, light grayish brown, or dark grayish brown. It ranges from 4 to 19 inches in thickness. The B and C horizons are dark grayish brown, light yellowish brown, light gray, brown, grayish brown, pale brown, or very pale brown. Texture between depths of 10 and 40 inches averages fine sandy loam, but subhorizons within this layer range from clay loam to loamy fine sand. Stratification ranges from slight to very evident. Calcium carbonate varies from a few films and threads to a few very fine concretions. Depth to the C horizon ranges from 25 to 55 inches. This horizon generally ranges from loamy sand to clay loam, but in some places the lower strata are sand.

Guadalupe fine sandy loam (Gu).—This nearly level to gently sloping soil is on flood plains of creeks and major drainageways. The soil is weakly undulating. Most areas of this soil are subject to brief flooding about 1 year in 4. Each flood leaves a thin layer of fresh alluvium on the surface. Most areas are less than 1,000 feet wide and are elongated up and down the drainageways. Where it is adjacent to streams, this soil mainly is a few feet above the channel. The slope is dominantly about 0.6 percent.

Included with this soil in mapping are areas of Bippus, Spur, Sweetwater, and Lincoln soils and small stream channels.

This soil is used for crops and range. A few areas are irrigated. The hazard of soil blowing is moderate. Dryland capability unit IIIe-4, irrigated capability unit IIe-3, Loamy Bottomland range site.

Likes Series

The Likes series consists of deep, moderately rapidly permeable soils on uplands. These soils formed in sandy eolian and outwash materials.

In a representative profile the surface layer is brown, calcareous loamy fine sand about 5 inches thick. The underlying material is pale-brown, loose loamy sand to a depth of 16 inches over light yellowish-brown loamy sand to a depth of 60 inches.

These soils are excessively drained. Available water capacity is low.

Representative profile of Likes loamy fine sand, undulating, 5.0 miles east of Follett on Texas Highway No. 15, then 3.4 miles south on a county road, then 100 feet west into range, in sec. 1054:

A1—0 to 5 inches, brown (10YR 5/3) loamy fine sand, brown (10YR 4/3) moist; weak, medium, granular structure; soft, very friable; few very fine calcium

carbonate pebbles; calcareous; moderately alkaline; gradual, wavy boundary.

C1—5 to 16 inches, pale-brown (10YR 6/3) loamy sand, brown (10YR 5/3) moist; weak, fine, granular structure; soft, loose; few very fine calcium carbonate pebbles; calcareous; moderately alkaline; diffuse, wavy boundary.

C2—16 to 60 inches, light yellowish-brown (10YR 6/4) loamy sand, yellowish brown (10YR 5/4) moist; massive; soft, loose; few fine calcium carbonate pebbles; calcareous; moderately alkaline.

The A horizon is brown, grayish brown, light brownish gray, or pale brown. It ranges from 5 to 12 inches in thickness and is fine sandy loam, loamy fine sand, or loamy sand. The horizon ranges from neutral to moderately alkaline. The C horizon is very pale brown, light yellowish brown, light brown, pale brown, or pink. It is loamy fine sand, loamy sand, or fine sand.

Likes loamy fine sand, undulating (LkC).—This soil is in valleys and on valley side slopes. Areas of this soil are elongated and average about 50 acres in size. Slope ranges from 1 to 8 percent but is dominantly about 4 percent.

Included with this soil in mapping are areas of Mobeetie, Veal, Tivoli, Devol, Lincoln, and Potter soils, and areas of sloping and eroded soils.

This soil is used for range. It absorbs moisture rapidly during periods of normal rainfall and loses little or no water as runoff. The hazard of soil blowing is high. Dryland capability unit VIe-1, Sandyland range site.

Lincoln Series

The Lincoln series consists of deep, rapidly permeable soils on bottom lands. These soils formed in calcareous, sandy, recent alluvium.

In a representative profile the surface layer is pale-brown fine sandy loam about 6 inches thick. The underlying material is very pale brown, stratified loamy fine sand in the upper 14 inches; very pale brown, loose loamy sand in the next 15 inches; and light-gray, loose sand to a depth of 60 inches. A water table is at a depth of about 50 inches.

This soil is somewhat excessively drained. Available water capacity is low.

Representative profile of Lincoln fine sandy loam in an area of Lincoln soils, 1.2 miles west of Texas Highway No. 305 at the southwest corner of Lipscomb townsite on a county road, then 50 feet south into range; 50 feet west of the channel of Sand Creek:

A1—0 to 6 inches, pale-brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; weak, fine, granular structure; slightly hard, very friable; common roots; calcareous; moderately alkaline; abrupt, smooth boundary.

C1—6 to 20 inches, very pale brown (10YR 7/4) loamy fine sand, light yellowish brown (10YR 6/4) moist; massive; loose; distinct bedding planes and a few thin strata of fine sandy loam and clay loam as much as 1 inch thick; calcareous; moderately alkaline; clear, smooth boundary.

C2—20 to 35 inches, very pale brown (10YR 7/3) loamy sand, pale brown (10YR 6/3) moist; massive; loose; few distinct bedding planes as much as ½ inch thick of dark-colored loamy fine sand and fine sandy loam; calcareous; moderately alkaline; gradual, smooth boundary.

C3—35 to 60 inches, light-gray (10YR 7/2) sand, light brownish gray (10YR 6/2) moist; massive; loose; few very fine quartz and caliche pebbles; water table at a depth of about 50 inches; calcareous; moderately alkaline.

The A horizon is brown, pale brown, or grayish brown. It ranges from 6 to 10 inches in thickness. This horizon is fine sandy loam, silty clay loam, clay loam, sandy clay loam, loamy fine sand, loamy sand, or sand. The C horizon is very pale brown, pale brown, pink, light gray, or light brownish gray. Stratification between depths of 10 and 40 inches ranges from faint to distinct. Lenses of loamy material total 3 inches or more in thickness, and the mixed texture between depths of 10 and 40 inches is loamy fine sand. A water table is at a depth of 4 to 10 feet in some places.

Lincoln soils (Ln).—These soils are on flood plains adjacent to the major drainageways and creeks (fig. 14). The soils are undulating. Areas of these soils range from small to large, depending on the size of the adjacent drainageway. Because of the low-lying positions of these soils, most areas are subject to frequent or occasional flooding. Most floods are short. Each flood scours the surface in some places and leaves a thin layer of fresh soil material on the surface in other places. The slope ranges from 0 to 1 percent but is dominantly about 0.6 percent.

Included with these soils in mapping are areas of Sweetwater, Spur, Guadalupe, Tivoli, Likes, Devol, and Bippus soils, and meandering stream channels.

These soils are used mostly for range. A water table is at a depth of 4 to 10 feet in some areas. The hazard of soil blowing is high. Dryland capability unit Vw-2, Sandy Bottomland range site.

Mansker Series

The Mansker series consists of deep, moderately permeable soils on uplands. These soils formed in calcareous, loamy material.

In a representative profile the surface layer is dark grayish-brown, calcareous loam in the upper 8 inches and brown, calcareous clay loam in the lower 7 inches. The next layer extends to a depth of about 85 inches. The upper 7 inches is very pale brown clay loam that is about 50 percent visible calcium carbonate (fig. 15); the next 28 inches is clay loam that is 20 to 40 percent visible calcium carbonate; and the next 28 inches is reddish-yellow, friable clay loam that is about 15 to 30 percent visible calcium carbonate; and the lower part is reddish-yellow, very friable sandy clay loam.

This soil is well drained. Available water capacity is medium.

Representative profile of Mansker loam, 1 to 3 percent slopes, 6 miles south of Booker on Texas Highway No. 23, then 5 miles east and 0.52 mile south on county roads, then 50 feet west into range; on the east side of sec. 944:

A11—0 to 8 inches, dark grayish-brown (10YR 4/2) loam, dark brown (10YR 3/3) moist; weak, coarse, prismatic structure parting to weak, fine, subangular blocky; hard, friable; many fine and very fine pores; common worm casts; few very fine caliche fragments; calcareous; moderately alkaline; clear, smooth boundary.

A12—8 to 15 inches, brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; weak, coarse, prismatic structure parting to moderate, fine, subangular

Figure 14.—Area of Lincoln soils along Wolf Creek.

blocky; hard, friable; many pores; many worm casts; few concretions and many threads and films of calcium carbonate; calcareous; moderately alkaline; clear, smooth boundary.

B21ca—15 to 22 inches, very pale brown (10YR 7/3) clay loam, light yellowish brown (10YR 6/4) moist; weak, coarse, prismatic structure parting to weak, fine, subangular blocky; hard, friable; many pores; many worm casts; about 50 percent visible calcium carbonate as medium to very fine soft masses and concretions; calcareous; moderately alkaline; clear, smooth boundary.

B22tca—22 to 35 inches, pink (7.5YR 8/4) clay loam, pink (7.5YR 7/4) moist; weak, coarse, prismatic structure parting to weak, fine, subangular blocky; hard, friable; many medium to very fine pores; few worm casts; few thin clay films on ped surfaces; 40 percent visible calcium carbonate as soft masses and a few concretions; calcareous; moderately alkaline; gradual, smooth boundary.

B23tca—35 to 50 inches, pink (7.5YR 7/4) clay loam, reddish yellow (7.5YR 6/6) moist; weak, medium, blocky structure; very hard, friable; few fine and very fine pores; few thin clay films on ped surfaces; 20 percent calcium carbonate as medium to very fine soft masses and a few very fine concretions; calcareous; moderately alkaline; clear, smooth boundary.

B24tca—50 to 70 inches, reddish-yellow (5YR 6/6) clay loam, yellowish red (5YR 5/6) moist; weak, medium, blocky structure; very hard, friable; many medium to very fine pores; few thin clay films on ped surfaces; 30 percent calcium carbonate as coarse to very fine soft masses and a few medium to very fine concretions; calcareous; moderately alkaline; clear, smooth boundary.

B25tca—70 to 78 inches, reddish-yellow (5YR 7/6) clay loam, reddish yellow (5YR 6/6) moist; weak, medium, subangular blocky structure; very hard, friable; many fine and very fine pores; few thin clay films on ped surfaces; 15 percent visible calcium carbonate as medium to very fine soft masses and concretions; calcareous; moderately alkaline; clear, wavy boundary.

B3—78 to 85 inches, reddish-yellow (5YR 7/6) sandy clay loam, reddish yellow (5YR 6/6) moist; weak, medium, subangular blocky structure; very hard, very friable; many medium to very fine pores; common threads and films of calcium carbonate; calcareous; moderately alkaline.

The A horizon is dark grayish brown, grayish brown, or brown and ranges from 8 to 20 inches in thickness. The A11 horizon ranges from 8 to 10 inches in thickness. The B21ca horizon begins at a depth of 13 to 20 inches and is pale brown, very pale brown, light brownish gray, light brown, light reddish brown, white, pink, or pinkish white. It is 12 to 20 inches thick and is 35 to 60 percent calcium carbonate. The B2tca horizon extends to a depth of more than 60 inches. It is reddish yellow, strong brown, or yellowish red. The B2tca horizon is silty clay loam, clay loam, or sandy clay loam and is 10 to 40 percent calcium carbonate.

Mansker loam, 1 to 3 percent slopes (McB).—This soil is in elongated areas on ridges and in elongated convex areas along drainageways. The slope is dominantly about 2 percent.

Included with this soil in mapping are areas of Acuff, Estacado, Berda, Olton, Portales, Veal, and Potter soils. Also included are small areas of nearly

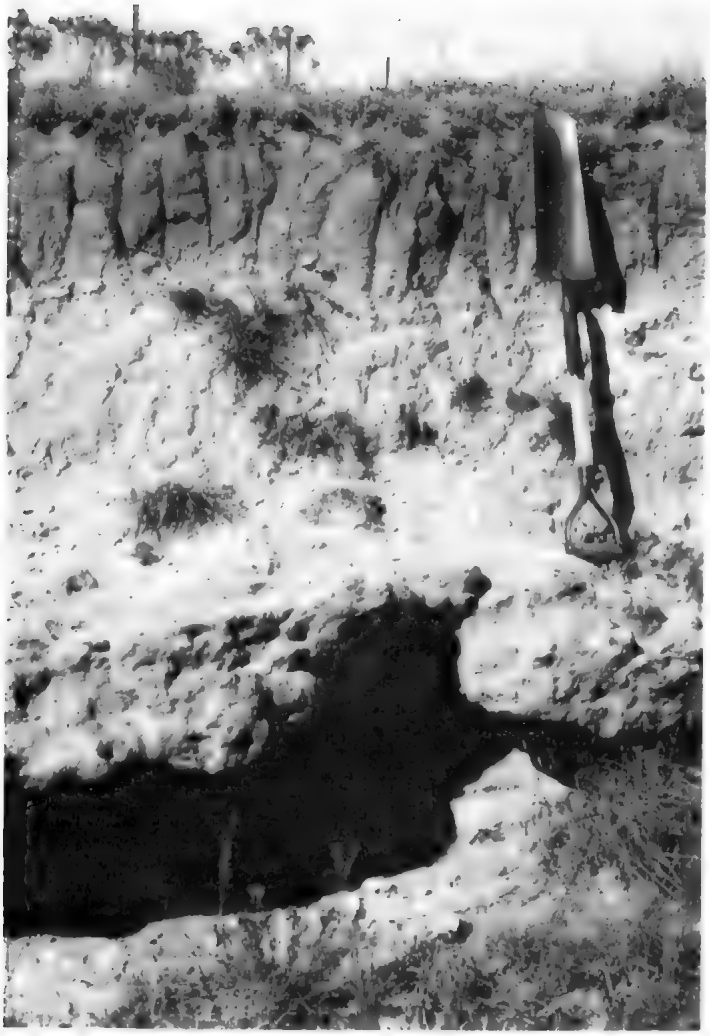

Figure 15.—**Profile of a Mansker loam that shows calcium carbonate accumulation.**

level soils and small areas of soils that have slopes of more than 3 percent.

This soil is used for range and crops. A few areas of this soil are irrigated. The hazard of soil blowing is slight, and the hazard of water erosion is moderate. Dryland capability unit IVe-2, irrigated capability unit IIIe-5, Hardland Slopes range site.

Mobeetie Series

The Mobeetie series consists of deep, moderately rapidly permeable soils on uplands (fig. 16). These soils formed in calcareous, loamy material.

In a representative profile the surface layer is grayish-brown, calcareous fine sandy loam about 8 inches thick. The next layer is fine sandy loam that reaches to a depth of 42 inches. The upper 10 inches is brown, and the lower 24 inches is light yellowish brown and contains some threads, films, and concretions of calcium carbonate. The underlying material, which reaches to a depth of 85 inches, is light-brown fine sandy loam.

Figure 16.—**Profile of a Mobeetie fine sandy loam.**

These soils are well drained. Available water capacity is medium.

Representative profile of Mobeetie fine sandy loam, 5 to 8 percent slopes, 8 miles south on Texas Highway No. 305 from its junction with Texas Highway No. 15 east of Darrouzett, then 5 miles east and 1 mile south on county roads, then 0.2 mile southeast on a ranch trail, then about 500 feet southwest into range to a point that is 60 feet northwest of the north end of a

stock tank dam; 0.2 mile south and 300 feet east of the northwest corner of sec. 783.

A1—0 to 8 inches, grayish-brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; moderate, very fine, subangular blocky structure; slightly hard, very friable; common fine and very fine pores; common worm casts; calcareous; moderately alkaline; gradual, smooth boundary.

B21—8 to 18 inches, brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; weak, very coarse, prismatic structure parting to weak, fine, subangular blocky; slightly hard, very friable; many fine and medium pores; many worm casts; common films and threads and few fine and very fine fragments and concretions of calcium carbonate; calcareous; moderately alkaline; gradual, smooth boundary.

B22ca—18 to 42 inches, light yellowish-brown (10YR 6/4) fine sandy loam, yellowish brown (10YR 5/4) moist; weak, very coarse, prismatic structure parting to weak, fine, subangular blocky; slightly hard, very friable; common medium and fine pores; few worm casts; many threads and films of calcium carbonate on ped surfaces, few very fine calcium carbonate concretions; calcareous; moderately alkaline; diffuse, smooth boundary.

C—42 to 85 inches, light-brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/4) moist; massive; slightly hard, very friable; few threads and films and few very fine concretions of calcium carbonate; calcareous; moderately alkaline.

The A horizon is brown, pale brown, or grayish brown. It ranges from 6 to 15 inches in thickness and is fine sandy loam or loam. The B21 horizon is brown, pale brown, yellowish brown, light brown, light brownish gray, or reddish brown. In about 80 percent of the area, a weakly developed B22ca horizon that is 5 percent visible calcium carbonate is present. This horizon is light yellowish brown, brown, or light brown. Depth to the B22ca horizon ranges from 16 to 35 inches. The C horizon is pink, reddish yellow, light brown, brown, or light yellowish brown fine sandy loam or loamy fine sand. Layers of caliche or buried clay loam are below a depth of 40 inches in a few places.

In mapping unit MrD, about 6 percent of the acreage is outside the range defined for the Mobeetie series because the depth to free carbonate is about 28 inches. The definition of the Mobeetie series requires that depth to carbonate be less than 15 inches. Use, management, and behavior of this soil are similar to those of Mobeetie soils.

The areas in mapping unit MxD are much larger and the composition is more variable than in other mapping units in the county. Mapping is controlled well enough, however, for the anticipated use of the soils in this association.

Mobeetie fine sandy loam, 1 to 3 percent slopes (MrB).—This soil is on convex or plane foot slopes or low ridges. Areas of this soil are elongated and irregularly shaped. The slope is dominantly about 2.0 percent.

Typically, this soil has a surface layer of brown, calcareous fine sandy loam about 7 inches thick. The next layer is fine sandy loam. The upper 10 inches is brown; the next 15 inches is yellowish brown and is about 2 percent visible calcium carbonate; and the lower 24 inches is light yellowish brown. The underlying material is light yellowish-brown fine sandy loam.

Included with this soil in mapping are areas of Paloduro, Veal, Berda, Likes, Mansker, Guadalupe, Bippus, and Grandfield soils. Also included are a few small areas of soils that have a thick, darkened surface layer; areas of nearly level soils; areas of soils that have slopes of more than 3 percent; and areas of soils that are noncalcareous below a depth of 10 inches.

This soil is used for both range and crops. A few areas of this soil are irrigated. Chlorosis occurs in some crops on this soil because the calcium carbonate content is high. The hazard of soil blowing is moderate, and the hazard of water erosion is slight. Dryland capability unit IIIe-6, irrigated capability unit IIIe-4, Mixedland Slopes range site.

Mobeetie fine sandy loam, 3 to 5 percent slopes (MrC).—This soil is on ridges, on hillsides, and along drainageways. Most areas of this soil are convex, but a few areas are plane or concave. Areas average about 40 acres in size and are irregularly shaped and elongated. The slope is dominantly about 3.8 percent.

Typically, this soil has a surface layer of grayish-brown, friable, calcareous fine sandy loam about 11 inches thick. The next layer is fine sandy loam. The upper 10 inches is pale brown, and the lower 24 inches is light brown and consists of about 4 percent visible calcium carbonate. The underlying material is pink fine sandy loam.

Included with this soil in mapping are areas of Devol, Veal, Mansker, Berda, Paloduro, Likes, Bippus, and Grandfield soils. Also included are a few areas of soils that have slopes of less than 3 percent, areas of sloping soils, and some areas of soils that are noncalcareous below a depth of 10 inches.

These soils are used for crops and range. Some of the water runs off during heavy rains. A few areas of this soil are irrigated. The hazards of soil blowing and water erosion are moderate. Dryland capability unit IVe-3, irrigated capability unit IVe-1, Mixedland Slopes range site.

Mobeetie fine sandy loam, 5 to 8 percent slopes (MrD).—This soil is in convex, concave, or plane areas. These areas range from 10 acres to more than 200 acres in size and are irregularly shaped. The slope is dominantly about 7 percent. Escarpments caused by erosion are advancing up some of the drainageways and leave U-shaped gullies.

This soil has the profile described as representative for the Mobeetie series.

Included with this soil in mapping are areas of Mansker, Potter, Spur, Guadalupe, Bippus, Likes, Estacado, Berda, Grandfield, Veal, and Devol soils. Also included are areas of gently sloping to strongly sloping soils, a few areas of soils that are noncalcareous below a depth of 10 inches, and a few areas that do not have free carbonate above a depth of 28 inches.

This soil is used mostly for range. The hazard of soil blowing is moderate, and the hazard of water erosion is high. Dryland capability unit VIe-3, Mixedland Slopes range site.

Mobeetie-Potter association, rolling (MxD).—The soils in this association are in large, irregularly shaped areas. Many small drainageways dissect these areas. The slope ranges from 5 to 16 percent but is dominantly about 10 percent. Escarpments caused by erosion are advancing up some of the drainageways and leave U-shaped gullies of various depths.

About 45 percent of this unit is Mobeetie soils, 25 percent is Potter soils, and 30 percent is other soils. The percentage of each soil varies from one area of the association to another. Mobeetie soils range from 30 to 60 percent of this association, and Potter soils range from 20 to 35 percent. These soils are in a recur-

ring pattern. Mobeetie soils are on the convex to concave foot slopes. Potter soils are on knobs and sides of ridges above the Mobeetie soils. These areas could be separated, but their use and management are similar and separation is not justified.

The Mobeetie soils have a surface layer of grayish-brown, calcareous fine sandy loam about 8 inches thick. The next layer is brown fine sandy loam about 25 inches thick. The underlying material is light-brown fine sandy loam.

The Potter soils have a surface layer of grayish-brown, calcareous fine sandy loam about 7 inches thick. The underlying material is pale-brown, slightly platy caliche in the upper 5 inches and pink, platy caliche below.

Included with this soil in mapping are Berda, Likes, Lincoln, Spur, Paloduro, Grandfield, Veal, Mansker, Guadalupe, and Bippus soils. Veal soils are the most extensive included soils and are mostly on tops and sides of ridges.

These soils are used as range. The steep slope, the shallow depth to caliche in the Potter soils, the mixture of very shallow and deep soils, and the hazard of erosion make areas of these soils difficult to manage. A few areas of these soils are mined for caliche. The hazard of water erosion is high. Mobeetie soils are in dryland capability unit VIe-3, Mixedland Slopes range site; Potter soils are in dryland capability unit VIIs-1, Very Shallow range site.

Olton Series

The Olton series consists of deep, moderately slowly permeable soils on uplands. These soils formed in calcareous, loamy material.

In a representative profile the surface layer is dark-brown clay loam about 10 inches thick. The next layer extends to a depth of 90 inches. The upper 6 inches is dark-brown firm clay loam; the next 20 inches is reddish-brown, firm, calcareous clay loam; the next 9 inches is pink clay loam that is about 30 percent visible calcium carbonate; and the lower 45 inches is reddish-yellow clay loam that is about 15 percent visible calcium carbonate.

These soils are well drained. Available water capacity is high.

Representative profile of Olton clay loam, 1 to 3 percent slopes, 150 feet north and 35 feet east of the southwest corner of sec. 324, block 43 of HTC RR Co. Survey; about 21 miles south of Booker in the southwestern part of Lipscomb County, and on Texas Highway No. 23, about 4 miles north of its junction with U.S. Highway No. 83:

Ap—0 to 4 inches, dark-brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; weak, granular structure; hard, friable; neutral; abrupt, smooth boundary.

A1—4 to 10 inches, dark-brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; moderate, fine, subangular blocky structure; very hard, firm; common very fine pores; common worm casts; neutral; clear, smooth boundary.

B21t—10 to 16 inches, dark-brown (7.5YR 4/4) clay loam, dark brown (7.5YR 3/4) moist; moderate, fine and medium, blocky structure; very hard, firm, sticky; common very fine pores; few worm casts; ped surfaces shine when moist; mildly alkaline; clear, smooth boundary.

B22t—16 to 24 inches, reddish-brown (5YR 4/4) clay loam, dark reddish brown (5YR 3/4) moist; moderate, medium, blocky structure; very hard, firm, sticky; common very fine pores; few worm casts; ped surfaces shine when moist; few very fine concretions of calcium carbonate; calcareous below a depth of 18 inches; moderately alkaline; gradual, smooth boundary.

B23t—24 to 36 inches, reddish-brown (5YR 5/4) clay loam, reddish brown (5YR 4/4) moist; weak, medium and fine, blocky structure; very hard, firm; common very fine pores; ped surfaces shine faintly when moist; few, very fine, soft masses and concretions of calcium carbonate; calcareous; moderately alkaline; abrupt, wavy boundary.

B24tca—36 to 45 inches, pink (5YR 7/4) clay loam, yellowish red (5YR 5/6) moist; moderate, fine and very fine, subangular blocky structure; very hard, friable; common medium and fine pores; ped surfaces shine faintly when moist; 30 percent, by volume, visible calcium carbonate, mostly as soft masses but also as few fine and very fine concretions; calcareous; moderately alkaline; gradual, wavy boundary.

B25tca—45 to 90 inches, reddish-yellow (7.5YR 6/6) clay loam, strong brown (7.5YR 4/6) moist; moderate, medium and fine, blocky structure; very hard, firm, sticky; common fine and very fine pores; ped surfaces shine faintly when moist; few very fine ferrous manganese stains on ped surfaces; 15 percent visible calcium carbonate as fine and very fine soft masses and very fine concretions; calcareous; moderately alkaline.

The A horizon is brown or dark brown. It ranges from 6 to 14 inches in thickness and is clay loam or silty clay loam. The B21t horizon is brown, dark brown, or dark reddish brown. The rest of the Bt horizon above the Btca horizon is brown, strong brown, reddish brown, or yellowish red. The profile becomes calcareous at a depth of 14 to 24 inches. The Btca horizon is pink, light reddish brown, light brown, reddish yellow, reddish brown, yellowish red, or red.

Olton clay loam, 1 to 3 percent slopes (OlB).—This soil is in weakly convex, weakly concave, and plane areas. These areas average about 60 acres in size. The slope is dominantly about 2 percent.

This soil has the profile described as representative for the Olton series.

Included with this soil in mapping are areas of Tipton, Veal, Mansker, Darrouzett, Acuff, Estacado, and Spur soils. Also included are small areas of eroded soils, small areas of nearly level soils, and areas of soils that have slopes of more than 3 percent.

This soil is used for crops and range. Some areas of this soil are irrigated. The hazard of blowing is slight, and the hazard of water erosion is moderate. Dryland capability unit IIIe-2, irrigated capability unit IIe-1, Deep Hardland range site.

Olton clay loam, 3 to 5 percent slopes (OlC).—This soil is in plane, concave, and convex areas. These areas are about 40 acres in size and are elongated along ridges and drainageways. The slope is dominantly about 3.8 percent. Most areas where crops are grown are slightly eroded.

Typically, this soil has a plow layer of brown, friable clay loam about 9 inches thick. The next layer is clay loam. The upper 6 inches is dark brown; the next 22 inches is reddish brown and is calcareous in the lower 16 inches; the next 12 inches is yellowish red; and the

lower layer is pink and is about 30 percent visible calcium carbonate. The underlying material is reddish-yellow clay loam that is about 5 percent visible calcium carbonate.

Included with this soil in mapping are areas of Acuff, Darrouzett, Mansker, Veal, Estacado, Bippus, and Spur soils. Also included are small areas of sloping soils, areas of soils that have slopes of less than 3 percent, and areas of eroded soils. Most of the topsoil has been removed from the eroded soils, and there are shallow, crossable gullies about 60 feet apart. Deposits in the drainageways below the areas of eroded soils are 1 to 2 feet thick and cover about 2 acres of the drainageway.

This soil is used for crops and range. The hazard of soil blowing is slight, and the hazard of water erosion is high. Dryland capability unit IVe-6, Deep Hardland range site.

Paloduro Series

The Paloduro series consists of deep, moderately permeable soils on uplands. These soils formed in calcareous, loamy material.

In a representative profile the surface layer is dark grayish-brown, calcareous loam about 14 inches thick (fig. 17). The next layer is friable clay loam to a depth of 66 inches. The upper 18 inches is pale brown; the next 22 inches is light brown and contains some threads and films of calcium carbonate; and the lower 12 inches is brown.

These soils are well drained. Available water capacity is high.

Representative profile of Paloduro loam, 1 to 3 percent slopes, 10 miles south of Booker on Texas Highway No. 23, then 1.5 miles east on a county road, then 0.6 mile south and southeast on an oilfield road, then 50 feet north of an oil tank; 0.6 mile south and 0.4 mile west of the northeast corner of sec. 765:

A1—0 to 14 inches, dark grayish-brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate, very coarse, prismatic structure parting to moderate, very fine, subangular blocky; hard, friable; many fine pores; many worm casts; calcareous; moderatetly alkaline; clear, smooth boundary.

B21—14 to 32 inches, pale-brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; moderate, very coarse, prismatic structure parting to weak, fine, subangular blocky; hard, friable; common fine pores; common worm casts; few threads and films of calcium carbonate; calcareous; moderately alkaline; gradual, smooth boundary.

B22—32 to 54 inches, light-brown (7.5YR 6/4) clay loam, brown (7.5YR 5/4) moist; moderate, very coarse, prismatic structure parting to weak, fine, subangular blocky; hard, friable; common fine pores; common threads and films of calcium carbonate; calcareous; moderately alkaline; diffuse, smooth boundary.

B23—54 to 66 inches, brown (7.5YR 5/4) clay loam, brown (7.5YR 4/4) moist; weak, coarse, prismatic structure parting to weak, medium, subangular blocky; hard, friable; few threads and films of calcium carbonate; calcareous; moderately alkaline.

The A horizon is brown, dark brown, or dark grayish brown. It ranges from 10 to 20 inches in thickness and is clay loam or loam. The A horizon is noncalcareous in about 30 percent of the area. The B2 horizon is light yellowish brown, yellowish brown, brown, grayish brown, pale brown, reddish brown, light brown, or pink. It is sandy clay loam or clay loam and has from a few films and threads to as much as 5 percent visible calcium carbonate in soft masses and concretions.

The areas in mapping unit PbD are much larger and the composition is more variable than in other mapping units in the county. Mapping has been controlled well enough, however, for the anticipated use of the soils.

Paloduro loam, 0 to 1 percent slopes (PaA).—This soil is in weakly concave and undulating areas. These areas average about 30 acres in size. The slope is dominantly about 0.6 percent.

This soil has a surface layer of dark grayish-brown, calcareous loam about 14 inches thick. The upper 10 inches of the next layer is grayish-brown clay loam, the next 38 inches is pale-brown clay loam that is about 2 percent visible calcium carbonate, and the lower part is light-brown sandy clay loam that is about 4 percent visible calcium carbonate.

Included with this soil in mapping are areas of Berda, Bippus, and Spur soils.

These soils are used for crops and range. A few areas of this soil are irrigated. The hazard of soil blowing is slight. Dryland capability unit IIIe-7, irrigated capability unit I-2, Hardland Slopes range site.

Paloduro loam, 1 to 3 percent slopes (PaB).—This soil is in concave or weakly undulating areas. These areas

Figure 17.—Profile of a Paloduro loam.

range from 5 to 100 acres in size and are irregularly shaped. The slope is dominantly about 1.8 percent.

This soil has the profile described as representative for the Paloduro series.

Included with this soil in mapping are areas of Bippus, Berda, Grandfield, Mobeetie, and Veal soils, small areas of nearly level soils, and small areas of soils that have slopes of more than 3 percent.

This soil is used for range and crops. A few areas of this soil are irrigated. The hazard of soil blowing is slight, and the hazard of water erosion is moderate. Dryland capability unit IIIe-2, irrigated capability unit IIe-2, Hardland Slopes range site.

Paloduro loam, 3 to 5 percent slopes (PaC).—This soil is on hillsides. In most areas this soil is weakly concave. Areas are 5 to 80 acres in size. Most areas that are used for crops are eroded by water. The slope is dominantly about 4 percent.

This soil has a surface layer of dark-brown, calcareous loam about 13 inches thick. The next layer is brown sandy clay loam in the upper 12 inches; brown, friable sandy clay loam that contains some threads and films of calcium carbonate in the next 20 inches; and yellowish-brown sandy clay loam below.

Included with this soil in mapping are areas of Berda, Bippus, Grandfield, Mobeetie, Portales, and Veal soils, small areas of soils that have slopes of less than 3 percent, and small areas of sloping soils.

This soil is used for range and crops. A few areas of this soil are irrigated. The hazard of soil blowing is slight. The hazard of water erosion is moderate. Dryland capability unit IVe-4, irrigated capability unit IVe-2, Hardland Slopes range site.

Paloduro, Veal and Berda soils, rolling (PbD).—The soils in this undifferentiated group are in irregularly shaped areas that are 10 acres to more than 300 acres in size. These areas are along ridges, on hillsides, and in valleys. The slope ranges from 5 to 12 percent but is dominantly about 8.5 percent. Escarpments caused by erosion are advancing up some of the drainageways and leaving U-shaped gullies.

About 40 percent of this mapping unit is Paloduro soils, 25 percent is Veal soils, 20 percent is Berda soils, and 15 percent is other soils. The percentage of each soil varies from area to area. Paloduro soils make up 0 to 70 percent of areas of the mapping unit, Veal soils 0 to 60 percent, and Berda soils 0 to 50 percent. Paloduro soils are on foot slopes, on hillsides, and in concave areas. Veal soils are on ridges and in convex areas. Berda soils are on hillsides and foot slopes. These soils are not uniform, and their distribution is irregular.

The Paloduro soils have a surface layer of dark grayish-brown, calcareous loam about 11 inches thick. The next layer is clay loam. The upper 19 inches is brown, the next 20 inches is light brown and is about 3 percent calcium carbonate, and the lower part is pink and calcareous.

The Veal soils have a surface layer of grayish-brown, calcareous clay loam about 8 inches thick. The next layer is clay loam. The upper 9 inches is pale brown, and the lower 15 inches is very pale brown and is about 25 percent calcium carbonate. The underlying material is pink loam that is about 10 percent calcium carbonate.

The Berda soils have a surface layer of grayish-brown, calcareous loam about 9 inches thick. The next layer is loam. The upper 19 inches is brown, and the lower 23 inches is pale brown and contains a few threads and films of calcium carbonate. The underlying material is brown, friable loam.

Included with this soil in mapping are areas of Bippus, Mansker, Mobeetie, Portales, Potter, and Spur soils.

The soils in this mapping unit are not suitable for cultivation, because of slope. They are used for range. The hazard of soil blowing is slight, and the hazard of water erosion is high. Dryland capability unit VIe-2, Hardland Slopes range site.

Paloduro, Veal, and Portales soils, 3 to 5 percent slopes (PdC).—The soils of this undifferentiated group are on ridges and hillsides and along drainageways. Most areas of these soils are elongated and parallel drainageways. These areas average about 80 acres in size. The slope is dominantly about 4 percent. Most areas that have been cultivated are eroded. Sheet erosion has removed several inches of topsoil. Shallow washes and rills are in most unterraced fields. Deposits of fresh alluvium as much as 3 feet deep are in many of the drainageways in areas of this group.

About 30 percent of this unit is Paloduro soils, 30 percent is Veal soils, 25 percent is Portales soils, and 15 percent is other soils. The percentage of each soil varies from area to area. Paloduro soils make up 20 to 45 percent of areas of this group, Veal soils 20 to 40 percent, and Portales soils 15 to 35 percent. Paloduro soils are in concave areas on hillsides. Veal soils are in convex areas and on ridges. Portales soils are in plane to weakly concave or convex areas. The soil pattern is not uniform, and distribution is irregular.

The Paloduro soils in this group have a surface layer of dark grayish-brown, calcareous loam about 12 inches thick. The next layer is clay loam. The upper 13 inches is brown, the next 17 inches is pale brown and has a few concretions and soft masses of calcium carbonate, and the lower part is pale brown.

The Veal soils in this group have a surface layer of brown, calcareous sandy clay loam about 6 inches thick. The next layer is clay loam. The upper 8 inches is brown, and the lower 16 inches is pale brown and is about 20 percent visible calcium carbonate. The underlying material is light yellowish-brown clay loam that is about 5 percent visible calcium carbonate.

The Portales soils in this group have a surface layer of dark grayish-brown, calcareous clay loam about 11 inches thick. The next layer is clay loam. The upper 14 inches is brown, and the lower 13 inches is light brown and is about 20 percent visible calcium carbonate. The underlying material is light-brown clay loam that is about 10 percent visible calcium carbonate.

Included with this soil in mapping are areas of Mansker, Acuff, Potter, Berda, Olton, and Bippus soils. Also included are small areas of sloping soils and small areas of soils that have slopes of less than 3 percent.

Most of the areas of this group are used for range and crops. Some areas are irrigated. Some of the water runs off during the heavier rains. Many fields are terraced to control water erosion. The hazard of soil blowing is slight, and the hazard of water erosion is

moderate. Dryland capability unit IVe-4, irrigated capability unit IVe-2, Hardland Slopes range site.

Portales Series

The Portales series consists of deep, moderately permeable soils on uplands. These soils formed in calcareous, loamy material.

In a representative profile the surface layer is dark grayish-brown, calcareous clay loam about 12 inches thick. The next layer is friable clay loam about 36 inches thick. It is pale brown in the upper 18 inches and very pale brown in the lower 18 inches. The underlying material is pinkish-white, friable loam that is about 30 percent visible calcium carbonate to a depth of 65 inches and pink fine sandy loam that is about 10 percent visible calcium carbonate to a depth of 90 inches.

These soils are well drained. Available water capacity is medium.

Representative profile of Portales clay loam, 1 to 3 percent slopes, 4.5 miles north of the junction of Texas Highway No. 15 and Farm Road 1454, which is 1 mile east of Follett, then 50 feet west into a field; 150 feet south of the Oklahoma State line and 50 feet west of the east side of sec. 26:

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak, fine, granular structure; slightly hard, friable; calcareous; moderately alkaline; abrupt, smooth boundary.

A1—8 to 12 inches, dark grayish-brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate, fine, subangular blocky structure; hard, friable; many fine pores; many worm casts; calcareous; moderately alkaline; clear, smooth boundary.

B21—12 to 20 inches, pale-brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; moderate, coarse, prismatic structure parting to moderate, fine, subangular blocky; hard, friable; many fine and very fine pores; common worm casts; few threads and films of calcium carbonate; calcareous; moderately alkaline; clear, smooth boundary.

B22—20 to 30 inches, pale-brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; moderate, coarse, prismatic structure parting to moderate, fine, subangular blocky; hard, friable; common fine pores; few worm casts; common films and threads of calcium carbonate; calcareous; moderately alkaline; clear, smooth boundary.

B3ca—30 to 48 inches, very pale brown (10YR 8/3) clay loam, light yellowish brown (10YR 6/4) moist; weak, medium, subangular blocky structure parting to weak, coarse, prismatic; hard, friable; many fine pores; about 20 percent; by volume, visible calcium carbonate as medium to very fine soft masses and concretions; calcareous; moderately alkaline; clear, wavy boundary.

C1ca—48 to 65 inches, pinkish-white (7.5YR 8/2) loam, pink (7.5YR 7/4) moist; weak, coarse, prismatic structure parting to weak, medium, subangular blocky; friable; common medium to very fine pores; 30 percent, by volume, visible calcium carbonate as coarse to very fine soft masses and concretions; calcareous; moderately alkaline; gradual, wavy boundary.

C2—65 to 90 inches, pink (7.5YR 8/4) fine sandy loam, light brown (7.5YR 6/4) moist; massive; very hard, friable; weakly cemented packsand that is 10 percent visible calcium carbonate as coarse to very fine soft masses and concretions; calcareous; moderately alkaline.

The A horizon is dark brown, brown, or dark grayish brown. It ranges from 11 to 14 inches in thickness and is sandy clay loam or clay loam. The B2 horizon is brown or pale brown. It ranges from 6 to 20 inches in thickness and is loam or clay loam. Depth to the horizon of calcium carbonate accumulation ranges from 20 to 34 inches. The B3ca horizon is pink, light brown, very pale brown, or pinkish gray and ranges from 10 to 35 inches in thickness. This horizon is loam or clay loam and is 15 to 50 percent visible calcium carbonate. The C horizon is pink, pinkish white, light brown, or very pale brown. It is loam, sandy clay loam, fine sandy loam, or clay loam. In some places, weakly cemented sandstone is below a depth of 60 inches.

Portales clay loam, 1 to 3 percent slopes (PoB).—This soil is in convex areas and some areas that are undulating. Most areas are oblong. The slope is dominantly about 2 percent. Most cropped areas are slightly eroded.

Included with this soil in mapping are areas of Berda, Bippus, Grandfield, Mansker, Olton, Paloduro, Spur, Tipton, and Veal soils. Also included are areas of nearly level soils and areas of soils that have slopes of more than 3 percent.

This soil is used for range and crops. A few areas are irrigated. The hazard of water erosion is moderate, and the hazard of soil blowing is slight. Dryland capability unit IIIe-2, irrigated capability unit IIIe-2, Deep Hardland range site.

Potter Series

The Potter series consists of moderately permeable soils on uplands. These soils are very shallow to shallow over caliche (fig. 18). They formed in calcareous, loamy material.

In a representative profile the surface layer is grayish-brown, calcareous loam in the upper 5 inches and light brownish-gray gravelly loam in the lower 5 inches, which consists of about 30 percent caliche fragments as much as 3 inches in diameter. The underlying material is 4 inches of light-gray, fractured, platy caliche that has bright pendants of accumulated calcium carbonate on the undersides; 16 inches of pinkish-white, platy caliche; and 18 inches of pinkish-white weakly cemented caliche of loam texture that is about 60 percent visible calcium carbonate.

These soils are well drained. Available water capacity is low.

Representative profile of Potter loam in an area of Potter soils, rolling, 7.35 miles south of Booker on Texas Highway No. 23, then 0.1 mile east in range; 80 feet north of gas well site and 30 feet east of gas well road; 0.35 mile south and 0.1 mile east of the northwest corner of sec. 909:

A1—0 to 5 inches, grayish-brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; moderate, very fine, granular structure; hard, friable; many roots; few worm casts; common caliche fragments and pebbles as much as 1 inch in diameter; calcareous; moderately alkaline; clear, smooth boundary.

A12—5 to 10 inches, light brownish-gray (10YR 6/2) gravelly loam, grayish brown (10YR 5/2) moist; weak, fine, granular structure; slightly hard, friable; common roots; common worm casts; about 30 percent caliche fragments as much as 3 inches in diameter; calcareous; moderately alkaline; clear, wavy boundary.

C1ca—10 to 14 inches, light-gray (10YR 7/1) fractured platy caliche, light gray (10YR 7/2) moist; mas-

Figure 18.—**Profile of a Potter loam that shows the very shallow depth to caliche.**

sive; few roots between plates; tops of plates dull and undersides bright and have pendants of accumulated calcium carbonate; hardness slightly less than 3 on Mohs' scale; calcareous; moderately alkaline; gradual, wavy boundary.

C2ca—14 to 30 inches, pinkish-white (7.5YR 8/2), platy caliche rock, pinkish white (7.5YR 8/2) moist; massive; platy and angular caliche rock is such that it can be cut with a spade, hardness slightly less than 3 on Mohs' scale; few roots between plates; fresh appearing accumulations of calcium carbonate on plates; calcareous; moderately alkaline; gradual, wavy boundary.

C3ca—30 to 48 inches, pinkish-white (7.5YR 8/2), weakly cemented caliche earth of loam texture, pinkish gray (7.5YR 7/2) moist; massive; extremely hard, friable; easily cut by a spade; about 60 percent visible calcium carbonate; calcareous; moderately alkaline.

The A horizon is grayish brown, light brownish gray, brown, dark grayish brown, or pale brown. It is fine sandy loam, sandy clay loam, clay loam, or loam. The A11 horizon has as much as 15 percent caliche fragments, and the A12 horizon has as much as 35 percent caliche fragments. Depth to the C1ca horizon ranges from 4 to 12 inches. The Cca horizon is pink, pinkish white, very pale brown, pale brown, white, or light gray. It ranges from almost solid, platy caliche to a mixture of platy caliche and soft, powdery caliche and loamy material.

Potter soils, rolling (PrD).—These soils are along convex ridges at the edge of the High Plains and on high ridges or caprock remnants extending outward from the High Plains. Slope ranges from 5 to 16 percent but is dominantly about 7 percent.

Included with these soils in mapping are areas of Mansker, Veal, Berda, Portales, and Mobeetie soils and areas of bare caliche rock.

These soils are used mostly as range. A few areas of these soils are mined for caliche. The very shallow depth to caliche precludes the use of these soils for crops. Dryland capability unit VIIs-1, Very Shallow range site.

Pullman Series

The Pullman series consists of deep, very slowly permeable soils on uplands. These soils formed in loamy, calcareous material presumed to be of eolian origin.

In a representative profile the surface layer is dark grayish-brown silty clay loam about 8 inches thick. The next layer extends to a depth of 90 inches. The upper 18 inches is dark grayish-brown, very firm clay; the next 29 inches is brown, very firm clay; the next 15 inches is yellowish-red clay loam; and the lower 20 inches is light-brown clay loam that is about 20 to 40 percent visible calcium carbonate.

These soils are well drained. Available water capacity is high.

Representative profile of Pullman silty clay loam, 0 to 1 percent slopes, 4.85 miles south on Texas Highway No. 305 from its junction with Texas Highway No. 15, then 50 feet west into a field, 800 feet north and 50 feet west of the southeast corner of sec. 984:

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak, very fine, granular structure; very hard, friable; neutral; abrupt, smooth boundary.

B21t—8 to 12 inches, dark grayish-brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate, fine, blocky structure; very hard, very firm; common very fine pores; few thin clay films on ped surfaces; mildly alkaline; clear, smooth boundary.

B22t—12 to 26 inches, dark grayish-brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate, medium, blocky structure; extremely hard, very firm, sticky; few very fine pores; few thin clay films on ped surfaces; mildly alkaline; diffuse, smooth boundary.

B23t—26 to 38 inches, brown (10YR 5/3) clay, dark brown (10YR 4/3) moist; moderate, medium, blocky structure; extremely hard, very firm, sticky; few very fine pores; few thin clay films on ped surfaces; few very fine ferrous manganese concretions; few threads and films and very fine soft masses of

calcium carbonate; calcareous; moderately alkaline; diffuse, smooth boundary.

B24t—38 to 55 inches, brown (7.5YR 5/4) clay, brown (7.5YR 4/4) moist; weak, medium, blocky structure; very hard, very firm, sticky; common very fine pores; few thin clay films on ped surfaces; few very fine ferrous manganese concretions; few threads and films of calcium carbonate; calcareous; moderately alkaline; clear, smooth boundary.

B25t—55 to 70 inches, yellowish-red (5YR 5/6) clay loam, yellowish red (5YR 4/6) moist; weak, medium, blocky structure; very hard, firm, sticky; common very fine pores; few thin clay films on ped surfaces; few very fine ferrous manganese concretions; few threads and films of calcium carbonate; calcareous; moderately alkaline; clear, wavy boundary.

B26tca—70 to 85 inches, light-brown (7.5YR 6/4) clay loam, brown (7.5YR 5/4) moist; weak, medium, blocky structure; very hard, firm, sticky; common medium and fine pores; few thin clay films on ped surfaces; about 40 percent calcium carbonate as medium to very fine concretions and soft masses; calcareous; moderately alkaline; gradual, wavy boundary.

B27tca—85 to 90 inches, light-brown (7.5YR 6/4) clay loam, brown (7.5YR 5/4) moist; weak, medium, blocky structure; very hard, firm, sticky; few thin clay films on ped surfaces; about 20 percent visible calcium carbonate as medium to very fine soft masses and concretions; calcareous; moderately alkaline.

The A horizon is grayish brown or dark grayish brown and ranges from 5 to 12 inches in thickness. The Bt horizon extends to a depth below 60 inches. The B21t and B22t horizons are brown or dark grayish brown. The rest of the Bt horizon above the Btca horizon is brown, dark brown, reddish yellow, yellowish red, or yellowish brown. The profile becomes calcareous at a depth of 15 to 30 inches. Depth to the Btca horizon ranges from 30 to 70 inches. Content of visible calcium carbonate ranges from 20 to 50 percent. The Btca horizon is reddish-yellow, brown, pink, light-brown, or yellowish-red silty clay loam or clay loam.

Pullman silty clay loam, 0 to 1 percent slopes (PuA).—This soil is in plane areas on the High Plains. The slope is dominantly about 0.4 percent.

This soil has the profile described as representative for the Pullman series.

Included with this soil in mapping are areas of Darrouzett, Olton, Estacado, and Randall soils and a few small areas of gently sloping soils.

This soil is used mostly for crops. Some areas of this soil are irrigated (fig. 19). The hazard of soil blowing is slight. Dryland capability unit IIIe-5, irrigated capability unit IIs-1, Deep Hardland range site.

Pullman silty clay loam, 1 to 3 percent slopes (PuB).—This soil is in plane and convex areas on the High Plains. These areas are elongated around playas or along drainageways and average about 40 acres in size. The slope is dominantly about 1.5 percent. Most cropped areas appear to be slightly eroded by water.

Typically, this soil has a surface layer of dark grayish-brown silty clay loam about 5 inches thick. The next layer extends to a depth of 80 inches. The upper 19 inches is dark grayish-brown clay; the next 16 inches is brown clay; the next 15 inches is yellowish-brown clay loam; the next 10 inches is pink clay loam that is about 30 percent visible calcium carbonate; and the lower 15 inches is yellowish-red clay loam that is about 10 percent visible calcium carbonate. The underlying material is light-brown clay loam that is about 30 percent calcium carbonate.

Included with this soil in mapping are areas of Darrouzett, Estacado, Mansker, Olton, and Randall soils. Also included are areas of eroded soils, small areas of nearly level soils, and small areas of soils that have slopes of more than 3 percent.

Figure 19.— **Preplanting furrow irrigation of Pullman silty clay loam, 0 to 1 percent slopes.**

This soil is used mostly for crops. Some is used for range. A few areas of this soil are irrigated. The hazard of water erosion is moderate, and the hazard of soil blowing is slight. Dryland capability unit IIIe-1, irrigated capability unit IIIe-1, Deep Hardland range site.

Randall Series

The Randall series consists of deep, very slowly permeable soils in playas. These soils formed in clayey sediment.

In a representative profile the surface layer is mainly dark-gray, extremely firm clay about 15 inches thick. The next layer is extremely firm clay about 40 inches thick. The upper 20 inches is gray, and the lower 20 inches is grayish brown. The underlying material is light brownish-gray, extremely firm, calcareous clay.

These soils are somewhat poorly drained. Available water capacity is high.

Representative profile of Randall clay, 6 miles west of Darrouzett on Texas Highway No. 15, then 1.0 mile south, 0.9 mile west, and 0.35 mile south on county roads, then 75 feet west into a playa; 125 feet south of the north shore of the playa along the east side of sec. 1170:

A11—0 to 2 inches, gray (10YR 5/1) silty clay, very dark gray (10YR 3/1) moist; moderate, very fine, subangular blocky structure; very hard, very firm; few very fine ferrous manganese concretions; neutral; clear, wavy boundary.

A12—2 to 15 inches, dark-gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate, very fine, blocky structure; extremely hard, extremely firm, very sticky and plastic; pressure faces on ped surfaces; few very fine ferrous manganese concretions; neutral; gradual, wavy boundary.

AC1—15 to 35 inches, gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; weak, medium and fine, blocky structure; extremely hard, extremely firm, very sticky and plastic; few intersecting slickensides; pressure faces on ped surfaces; few very fine ferrous manganese concretions; mildly alkaline; diffuse, wavy boundary.

AC2—35 to 55 inches, grayish-brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; weak, medium, blocky structure; extremely hard, extremely firm, very sticky and plastic; few very fine ferrous manganese concretions; common intersecting slickensides; pressure faces on ped surfaces; few, faint, brown mottles; few very fine calcium carbonate concretions; mildly alkaline; diffuse, wavy boundary.

C—55 to 80 inches, light brownish-gray (10YR 6/2) clay, dark grayish brown (10YR 4/2) moist; weak, medium, blocky structure; extremely hard, extremely firm, very sticky and plastic; pressure faces on ped surfaces; few very fine ferrous manganese concretions; common threads and films of calcium carbonate, mostly on ped surfaces, and few very fine concretions; calcareous; moderately alkaline.

The A horizon is gray or dark-gray clay or silty clay. It ranges from 12 to 20 inches in thickness. The AC horizon ranges from gray and grayish brown to dark gray. Depth to the C horizon ranges from 40 to 60 inches. The C horizon is gray, grayish brown, or light brownish gray.

Randall clay (Ra).—This nearly level soil is on floors of intermittent lakes, or playas, on the High Plains. Most areas are oval. These soils are in concave depressions that are 1 to 30 feet below the level of the surrounding plain. These areas range from a few acres to about 100 acres in size and average about 40 acres. Water collects in these depressions and remains until it evaporates. The undisturbed surface of the soil has gilgai microrelief.

Included with this soil in mapping are a few areas of soils that are 2 in chroma in the upper 40 inches.

Areas of this soil are used by migratory waterfowl. A small amount of grazing is obtained by livestock from this soil. A few areas have been drained and are used for crops. The hazard of soil blowing is moderate. When this soil is dry, it has cracks as much as 1.5 inches wide and more than 20 inches deep. Dryland capability unit VIw-1, included in range site of surrounding soils.

Springer Series

The Springer series consists of deep, moderately rapidly permeable soils on uplands. These soils formed in sandy eolian and outwash material.

In a representative profile the surface layer is brown, neutral loamy fine sand about 11 inches thick. The next layer is brown to strong-brown fine sandy loam in the upper 32 inches and reddish-yellow loamy fine sand in the lower 15 inches The next layer is light-brown, loose loamy fine sand about 16 inches thick. Below this, and reaching to a depth of 85 inches, is brown, very friable fine sandy loam.

These soils are well drained. Available water capacity is low.

Representative profile of Springer loamy fine sand, 0 to 3 percent slopes, 3.6 miles northeast of the Hemphill County line on U.S. Highway No. 60, then 40 feet south into range:

A11—0 to 5 inches, brown (7.5YR 5/4) loamy fine sand, brown (7.5YR 4/4) moist; weak, very fine, subangular blocky structure; slightly hard, very friable; many roots; neutral; clear, wavy boundary.

A12—5 to 11 inches, brown (7.5YR 5/4) loamy fine sand, brown (7.5YR 4/4) moist; weak, very fine, subangular blocky structure; loose; many roots; neutral; wavy boundary.

B21t—11 to 27 inches, brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; weak, coarse, prismatic structure parting to weak, fine, subangular blocky; hard, friable; common roots; few worm casts; few thin clay films on ped surfaces; few horizontal layers ⅛ to ¼ inch thick of medium fine sandy loam; neutral; gradual, smooth boundary.

B22t—27 to 38 inches, strong-brown (7.5YR 5/6) fine sandy loam, strong brown (7.5YR 4/6) moist; weak, coarse, prismatic structure; slightly hard, very friable; common roots; few thin clay films on ped surfaces; neutral; clear, smooth boundary.

B23t—38 to 43 inches, brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; weak, coarse, prismatic structure; slightly hard, friable; few thin clay films on ped surfaces; neutral; gradual, smooth boundary.

B3—43 to 58 inches, reddish-yellow (7.5YR 6/6) loamy fine sand, strong brown (7.5YR 5/6) moist; weak, coarse, prismatic structure; slightly hard, very friable; neutral; clear, smooth boundary.

A'1—58 to 74 inches, light-brown (7.5YR 6/4) loamy fine sand, brown (7.5YR 5/4) moist; massive; loose; neutral; gradual, smooth boundary.

B'2t—74 to 85 inches, brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; massive; slightly hard, very friable; neutral.

The A horizon is brown or yellowish brown and ranges from 8 to 14 inches in thickness. The B2t and B3 horizons are brown, strong brown, light brown, reddish yellow, or dark brown. The A' horizon is brown or light brown, and the B't horizon is reddish yellow or brown.

Springer loamy fine sand, 0 to 3 percent slopes (SlB).—This soil generally is undulating. Areas average about 50 acres in size, but a few are as large as 200 acres. The slope is dominantly about 2.0 percent. Drainage patterns are poorly defined.

Included with this soil in mapping are areas of Grandfield, Likes, Veal, Mobeetie, and Tivoli soils and some small playas. Also included are some profiles of soils that have lower layers of sandy clay loam, some areas of soils that has slopes of more than 3 percent, some small areas of eroded soils, and some areas of lighter colored soils.

This soil is used mostly for range or pasture. A few areas are used for crops. Most of the rainfall soaks into the ground, and there is little runoff. The hazard of soil blowing is high. Dryland capability unit IVe-5, irrigated capability unit IVe-3, Sandyland range site.

Spur Series

The Spur series consists of deep, moderately permeable soils on bottom lands. These soils formed in calcareous, loamy, recent alluvial sediment underlain by sandy sediment.

In a representative profile the surface layer is very dark grayish-brown, calcareous silty clay loam in the upper 9 inches and dark-brown, calcareous clay loam in the lower 7 inches. The next layer is brown clay loam about 16 inches thick. The underlying material is brown sandy clay loam that has a few threads and films of calcium carbonate in the upper 8 inches and light yellowish-brown, loose loamy fine sand that has thin strata of loamy material in the lower part.

These soils are well drained. Available water capacity is high.

Representative profile of a Spur silty clay loam in an area of Spur soils, 0.1 mile east on Texas Highway No. 15 from its junction with Farm Road 2248 just northeast of Darrouzett, then 2.15 miles northeast on a county road, then 400 feet southeast; 30 feet west of the present channel of Kiowa Creek, and 0.5 mile west and 0.2 mile north of the southeast corner of sec. 73:

A11—0 to 9 inches, very dark grayish-brown (10YR 3/2) silty clay loam, very dark brown (10YR 2/2) moist; moderate, medium, prismatic structure parting to moderate, fine, subangular blocky, hard, friable; many fine pores; many worm casts; calcareous; moderately alkaline; abrupt, smooth boundary.

A12—9 to 16 inches, dark-brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; moderate, medium, prismatic structure parting to moderate, very fine, subangular blocky; hard, friable; many fine pores; many worm casts; faint stratification; calcareous; moderately alkaline; abrupt, wavy boundary.

B—16 to 32 inches, brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; weak, medium, prismatic structure parting to weak, fine, subangular blocky; hard, friable; many fine and very fine pores; many worm casts; prominent strata of fine sandy loam to silty clay loam; calcareous; moderately alkaline; abrupt, wavy boundary.

C1—32 to 40 inches, brown (7.5YR 5/4) sandy clay loam, brown (7.5YR 4/4) moist; weak, fine, subangular blocky structure; hard, friable; few thin strata of loamy sand and loam; few threads and films of calcium carbonate; calcareous; moderately alkaline; abrupt, wavy boundary.

C2—40 to 66 inches, light yellowish-brown (10YR 6/4) loamy fine sand, yellowish brown (10YR 5/4) moist; single grained; loose; thin strata of fine sandy loam, loam, clay loam, and silty clay loam; calcareous; moderately alkaline.

The A horizon is very dark grayish brown, dark grayish brown, dark brown, or brown. It ranges from 11 to 19 inches in thickness and is silty clay loam, loam, or clay loam. The B horizon is brown, reddish-brown, or yellowish-brown loam or clay loam. Depth to the C horizon ranges from 32 to 50 inches. The C horizon is brown, pale-brown, light yellowish-brown, or grayish-brown sandy clay loam, fine sandy loam, loamy fine sand, or loam. Between depths of 10 to 40 inches are thin lenses of contrasting textures of loam, fine sandy loam, clay loam, silty clay loam, or loamy fine sand.

Spur soils (Sp).—These nearly level to gently sloping soils are on flood plains of creeks and major drainageways. The soils generally are undulating. Because of their low-lying position, most areas of these soils are subject to occasional to frequent flooding for brief periods at intervals of about 2 years. Most areas are less than 1,000 feet wide, are elongated, and are along the drainageways. The slope ranges from 0 to 2 percent and is dominantly about 0.5 percent. Texture of the surface layer varies.

Included with these soils in mapping are areas of Bippus, Sweetwater, Guadalupe, and Lincoln soils. Also included are small areas of soils in which the darkened surface laver is more than 20 inches thick, areas of soils that have a light-colored surface layer, sloughs, meandering stream channels, and streambanks.

These soils are used mostly for range. A few areas are used for crops, and some areas are irrigated. These soils receive extra water and fresh soil material from each flood. The hazard of soil blowing is slight. Dryland capability unit Vw-1, Loamy Bottomland range site.

Sweetwater Series

The Sweetwater series consists of deep, moderately permeable soils on bottom lands. These soils formed in calcareous loam over sandy alluvium under wet conditions.

In a representative profile the surface layer is calcareous sandy clay loam 17 inches thick. It is dark gray in the upper 11 inches, and it is gray and has yellowish-brown mottles in the lower 6 inches. The underlying material extends to a depth of 60 inches. The upper 8 inches is light brownish-gray loamy fine sand that has a few yellowish-brown mottles; the next 20 inches is light-gray loamy-fine sand; and the lower 15 inches is gray loamy fine sand.

These soils are poorly drained. Available water capacity is medium. The water table is generally at a depth of 20 to 36 inches, but the profile is saturated throughout at some period during the year.

Representative profile of a Sweetwater sandy clay loam in an area of Sweetwater soils, 5.0 miles northwest on Texas Highway No. 213 from its junction in Higgins with U.S. Highway No. 60, then 25 feet north

into range; 0.35 mile south and 100 feet west of the northeast corner of sec. 347:

A11—0 to 11 inches, dark-gray (10YR 4/1) sandy clay loam, very dark gray (10YR 3/1) moist; moderate, fine, granular structure; hard, friable; many roots; common worm casts; calcareous; moderately alkaline; clear, wavy boundary.

A12—11 to 17 inches, gray (10YR 6/1) sandy clay loam, dark gray (10YR 4/1) moist; moderate, fine, subangular blocky structure; very hard, friable; common roots; common worm casts; few, faint, fine and very fine, yellowish-brown mottles; calcareous; moderately alkaline; gradual, wavy boundary.

C1—17 to 25 inches, light brownish-gray (10YR 6/2) loamy fine sand, brown (10YR 5/3) moist; massive; hard, very friable; few, faint, fine and very fine, yellowish-brown mottles; calcareous; moderately alkaline; gradual, wavy boundary.

C2—25 to 45 inches, light-gray (10YR 7/2) loamy fine sand, grayish brown (10YR 5/2) moist; massive; hard, very friable; few roots; water table at a depth of about 25 inches; calcareous; moderately alkaline; clear, wavy boundary.

C3—45 to 60 inches, gray (10YR 5/1) loamy fine sand, very dark gray (10YR 3/1) moist; massive; hard, very friable; calcareous; moderately alkaline.

The A11 horizon is dark gray or very dark gray. It ranges from 10 to 21 inches in thickness and is sandy clay loam, clay loam, or silty clay loam. Where present, the A12 horizon is gray, grayish brown, or dark grayish brown. It is as much as 15 inches thick and is sandy clay loam, clay loam, or silty clay loam. Mottling is faint to distinct. The C horizon is brown, pale-brown, light brownish-gray, dark-gray, gray, or light-gray sand, loamy sand, or loamy fine sand. Depth to this horizon ranges from 12 to 24 inches. In some places it contains thin strata of very fine sandy loam, fine sandy loam, clay loam, or silty clay loam. Mottles are faint or distinct and yellowish in color.

Sweetwater soils (Sw).—These soils are nearly level and occur in drainageways and on bottom lands. The soils are weakly undulating. Areas of these soils are less than 1,000 feet wide in most places, are elongated, and are along the drainageways and larger creeks. The slope ranges from 0 to 1 percent but is dominantly about 0.6 percent. Because of their low-lying position, most areas of these soils are subject to occasional, generally brief flooding. Each flood leaves a thin layer of fresh soil material on the surface. Water stands in low places part of the time.

Included with this soil in mapping are areas of Lincoln and Guadalupe soils, sloughs, and stream channels. Also included are a few small areas of soils that have been drained by channel downcutting and no longer have a high water table.

These soils are used for range or hay. These soils are generally moist throughout, and because of wetness they provide year-round green forage. These areas are valuable for winter grazing. Scattered trees grow in some areas. These areas and the surrounding upland areas are good habitat for most kinds of wildlife. Dryland capability unit Vw-3, Loamy Bottomland range site.

Tipton Series

The Tipton series consists of deep, moderately permeable soils on uplands. These soils formed in calcareous, loamy material.

In a representative profile the surface layer is dark grayish-brown loam about 7 inches thick. The next layer extends to a depth of 92 inches. The upper 11 inches is dark grayish-brown clay loam, the next 42 inches is dark-brown clay loam, and the lower 32 inches is light reddish-brown clay loam.

These soils are well drained. Available water capacity is high.

Representative profile of Tipton loam, 1 to 3 percent slopes, 5 miles east of Follett on Texas Highway No. 15, then 0.3 mile south on a county road, then 75 feet west into range to a bluff on the north side of a creek:

A1—0 to 7 inches, dark grayish-brown (10YR 4/2) loam, dark brown (10YR 3/3) moist; moderate, very fine, subangular blocky structure; hard, friable; many pores; many roots; many worm casts; neutral; abrupt, smooth boundary.

B21t—7 to 18 inches, dark grayish-brown (10YR 4/2) clay loam, dark brown (10YR 3/3) moist; moderate, coarse, prismatic structure parting to moderate, fine, subangular blocky; very hard, firm; many very fine and fine pores; many worm casts; ped surfaces shine faintly when moist; neutral; clear, smooth boundary.

B22t—18 to 36 inches, dark-brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; moderate, coarse, prismatic structure parting to moderate, fine, subangular blocky; very hard, firm; common fine and very fine pores; common worm casts; ped surfaces shine faintly when moist; few threads and films of calcium carbonate; calcareous; moderately alkaline; clear, smooth boundary.

B23t—36 to 60 inches, brown (7.5YR 5/4) clay loam, brown (7.5YR 4/4) moist; moderate, coarse, prismatic structure parting to weak, fine, subangular blocky; very hard, friable; common fine and very fine pores; few worm casts; few clay films on ped surfaces; common threads and films of calcium carbonate on ped and pore surfaces; calcareous; moderately alkaline; clear, wavy boundary.

B24t—60 to 92 inches, light reddish-brown (5YR 6/4) clay loam, reddish brown (5YR 4/4) moist; moderate, coarse, prismatic structure parting to moderate, fine, subangular blocky; very hard, firm; common fine and very fine pores; few thin clay films on ped surfaces; common threads and films of calcium carbonate; calcareous; moderately alkaline.

The A horizon is grayish brown or dark grayish brown and ranges from 6 to 12 inches in thickness. The B21t horizon is brown, dark brown, or dark grayish brown. The structure ranges from weak to moderate in grade, from fine to coarse in size, and from subangular blocky to prismatic in type. The soil becomes calcareous at a depth of 17 to 32 inches. The lower part of the Bt horizon is brown, grayish brown, dark brown, light yellowish brown, light reddish brown, reddish brown, strong brown, yellowish brown, pale brown, pink, yellowish red, reddish yellow, or light brown. A horizon of calcium carbonate accumulation is below a depth of 60 inches in some places. Buried layers that are darkened are below a depth of 60 inches in a few places.

These soils are outside the range defined for the Tipton series because the B horizon has colors that are 10YR in hue. This difference does not affect the use, management, or behavior of the soils.

Tipton loam, 0 to 1 percent slopes (TpA).—This soil is in concave and plane areas on terraces above creeks. In some areas the soil is weakly undulating. Most areas are oval and average about 30 acres in size. The slope is dominantly about 0.6 percent.

This soil has a surface layer of dark grayish-brown loam about 8 inches thick. In the next layer the upper 14 inches is dark grayish-brown clay loam, the next 22 inches is grayish-brown clay loam that has thin films

of clay and calcium carbonate on the ped surfaces in the upper part and a few soft masses of calcium carbonate in the lower part, and the lower layer is grayish-brown clay loam that is 3 percent visible calcium carbonate. The underlying material is brown, subangular blocky clay loam.

Included with this soil in mapping are areas of Acuff, Bippus, Estacado, Altus, Grandfield, and Olton soils. Also included are small playas and small areas of gently sloping soils.

This soil is used for crops and range. A few areas are irrigated. The hazard of soil blowing is slight. Dryland capability unit IIe-1, irrigated capability unit I-2, Deep Hardland range site.

Tipton loam, 1 to 3 percent slopes (TpB).—This soil is in plane, weakly convex, or slightly concave areas. The soil is undulating. Areas of this soil are as much as about 200 acres in size and average about 80 acres. Most areas are elongated to oval. The slope is dominantly about 1.8 percent.

This soil has the profile described as representative for the Tipton series.

Included with this soil in mapping are areas of Acuff, Bippus, Darrouzett, Estacado, Grandfield, Mansker, Olton, and Paloduro soils. Also included are small areas of eroded soils, small areas of nearly level soils, and small areas of soils that have slopes of more than 3 percent.

This soil is used for crops and range. Some areas of this soil are irrigated. The hazards of soil blowing and water erosion are slight. Dryland capability unit IIe-2, irrigated capability unit IIe-2, Deep Hardland range site.

Tivoli Series

The Tivoli series consists of deep, rapidly permeable soils on uplands. These soils formed in eolian sands.

In a representative profile the surface layer is brown, neutral fine sand about 8 inches thick. The underlying material is loose fine sand that extends to a depth of 66 inches. The upper part is light yellowish brown, and the lower part is very pale brown.

These soils are excessively drained. Available water capacity is low.

Representative profile of Tivoli fine sand, 1.4 miles southwest on U.S. Highway No. 60 from its junction with Texas Highway No. 213 in Higgins, then 40 feet north into range:

A1—0 to 8 inches, brown (10YR 5/3) fine sand, dark brown (10YR 3/3) moist; weak, fine, granular structure; loose, very friable; few worm casts; neutral; clear, wavy boundary.

C1—8 to 25 inches, light yellowish-brown (10YR 6/4) fine sand, yellowish brown (10YR 5/4) moist; single grained; soft, loose; neutral; diffuse, wavy boundary.

C2—25 to 66 inches, very pale brown (10YR 7/4) fine sand, light yellowish brown (10YR 6/4) moist; single grained; loose; neutral.

The A horizon is grayish brown or brown and ranges from 5 to 10 inches in thickness. The C horizon is reddish yellow, light yellowish brown, very pale brown, pale brown, light brown, or brown and is neutral to mildly alkaline above a depth of 40 inches. In about 15 percent of the area, the profile is calcareous and moderately alkaline below a depth of 40 inches.

Tivoli fine sand (Tv).—This soil is in dunes 10 to 40 feet high. Slope ranges from 3 to 30 percent but is dominantly about 8 percent. These areas are normally irregularly shaped, but they are elongated adjacent to creeks. These areas range from 10 acres to more than 2,000 acres in size and average about 80 acres. Small, actively eroding blowout pits are in some areas of this soil.

Included with this soil in mapping are areas of Veal, Devol, Likes, Grandfield, Potter, and Mobeetie soils and small playas.

This soil is used for range. It is not suited to cultivation, because of the sand texture, steep slopes, and hazard of erosion. Most of the rainfall soaks into the ground, and there is little runoff. The hazard of soil blowing is high. Dryland capability unit VIIe-1, Deep Sand range site.

Veal Series

The Veal series consists of deep, moderately permeable soils on uplands. There soils formed in calcareous, loamy material.

In a representative profile the surface layer is grayish-brown, calcareous loam about 9 inches thick. The next layer is pale-brown, friable clay loam in the upper 7 inches and pinkish-gray, friable clay loam that is about 30 percent visible calcium carbonate in the lower 12 inches. The underlying material is pink loam that is about 20 percent visible calcium carbonate.

These soils are well drained. Available water capacity is medium. The high content of calcium carbonate causes chlorosis in some crops.

Representative profile of Veal loam, 1 to 3 percent slopes, 3 miles south of the junction of Texas Highway No. 15 and Farm Road 1454 on the east side of Follett, then 0.25 mile east on a county road, then 50 feet north into range; 0.25 mile east and 50 feet north of the southwest corner of sec. 1063:

A1—0 to 9 inches, grayish-brown (10YR 5/2) loam; dark grayish brown (10YR 4/2) moist; moderate, very fine, subangular blocky structure; slightly hard, very friable; common fine and very fine pores; common worm casts; few very fine caliche fragments; calcareous; moderately alkaline; gradual, smooth boundary.

B21—9 to 16 inches, pale-brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; weak, very coarse, prismatic structure parting to weak, fine, subangular blocky; hard, friable; many medium to very fine pores; common worm casts; few fine and very fine caliche fragments; about 35 percent calcium carbonate as common threads and films on ped surfaces; calcareous; moderately alkaline; gradual, wavy boundary.

B22ca—16 to 28 inches, pinkish-gray (7.5YR 7/2) clay loam, pinkish gray (7.5YR 6/2) moist; weak, very coarse, prismatic structure parting to weak, fine, subangular blocky; hard, friable; common medium to very fine pores; few worm casts; about 30 percent visible calcium carbonate in medium to very fine, soft masses and concretions; 45 percent total calcium carbonate; calcareous; moderately alkaline; diffuse, smooth boundary.

Cca—28 to 66 inches, pink (7.5YR 8/4) loam, light-brown (7.5YR 6/4) moist; massive; very hard, friable; weakly cemented; about 20 percent visible calcium carbonate in medium to very fine, soft masses and

concretions; 30 percent total calcium carbonate; calcareous; moderately alkaline.

The A horizon is grayish brown or brown. It ranges from 6 to 9 inches in thickness and is loam, fine sandy loam, or sandy clay loam. The B2 horizon is pale-brown, grayish-brown, or brown sandy clay loam, loam, or clay loam. Depth to the B2ca horizon ranges from 14 to 20 inches. The B2ca horizon is pinkish gray, light yellowish brown, pale brown, very pale brown, or light reddish brown. It ranges from 12 to 30 inches in thickness and is clay loam or sandy clay loam. Content of visible calcium carbonate ranges from 20 to 40 percent. The underlying horizons are light brown, light yellowish brown, very pale brown, pink, or pinkish white. They are loamy fine sand, sandy clay loam, fine sandy loam, loam, or clay loam and are 5 to 55 percent visible calcium carbonate. Weakly cemented caliche rock is below a depth of 40 inches in a few places.

Veal loam, 1 to 3 percent slopes (VeB).—This soil is in convex and plane areas on low ridges. Areas of this soil are commonly elongated and average about 40 acres in size. The slope is dominantly about 2 percent.

This soil has the profile described as representative for the Veal series.

Included with this soil in mapping are areas of Mobeetie, Potter, Grandfield, Mansker, and Acuff soils. Also included are small areas of nearly level soils and small areas of soils that have slopes of more than 3 percent.

This soil is used for crops and range. A few areas are irrigated. The hazard of soil blowing is slight, and the hazard of water erosion is moderate. Dryland capability unit IVe-2, irrigated capability unit IIIe-5, Hardland Slopes range site.

Veal loam, 3 to 5 percent slopes (VeC).—This undulating soil is on hillsides and ridges. Areas average about 30 acres in size. The slope is dominantly about 4 percent. Most cropped areas appear to be slightly eroded.

This soil typically has a surface layer of grayish-brown, calcareous loam about 9 inches thick. The next layer is brown sandy clay loam in the upper 10 inches and light yellowish-brown sandy clay loam that is about 40 percent visible calcium carbonate in the lower 16 inches. The underlying material is pink fine sandy loam that is about 30 percent visible calcium carbonate in the upper 20 inches and 15 percent visible calcium carbonate below.

Included with this soil in mapping are areas of Acuff, Devol, Mobeetie, Grandfield, Potter, Mansker, and Portales soils. Also included are small areas of soils that are severely eroded, that are sloping, or that have slopes of less than 3 percent.

This soil is used for range and crops. A few areas are irrigated. The hazard of soil blowing is slight, and the hazard of water erosion is moderate. Dryland capability unit IVe-4, irrigated capability unit IVe-2, Hardland Slopes range site.

Use and Management of the Soils

This section explains the use and management of the soils in Lipscomb County. The management of the soils for crops is discussed by capability units, both dryland and irrigated. Estimated yields of the principal crops are given. The management of the soils for range and for wildilfe habitat is discussed. The properties and features that affect engineering practices are also discussed.

Capability Grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The soils are grouped according to their limitations when used for field crops, the risk of damage when they are so used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops that require special management.

Those familiar with the capability classification can infer from it much about the behavior of soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for range, for forest trees, or for engineering.

In the capability system, the kinds of soil are grouped at three levels: the capability class, subclass, and unit. These are discussed in the following paragraphs.

CAPABILITY CLASSES, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use, defined as follows:

- Class I soils have few limitations that restrict their use.
- Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.
- Class III soils have severe limitations that reduce the choice of plants, require special conservation practices, or both.
- Class IV soils have very severe limitations that reduce the choice of plants, require very careful management, or both.
- Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife.
- Class VI soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture or range, woodland, or wildlife.
- Class VII soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture or range, woodland, or wildlife.
- Class VIII soils and landforms have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife, water supply, or esthetic purposes. (None in Lipscomb County.)

CAPABILITY SUBCLASSES are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion

unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in some parts of the United States, but not in this county, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by *w*, *s*, and *c*, because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, range, woodland, wildlife, or recreation.

CAPABILITY UNITS are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol; for example, IIe-3 or IIIe-1. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraphs; and the Arabic numeral specifically identifies the capability unit within each subclass.

Dryland capability units [2]

In this section the dryland capability units of Lipscomb County are described, and suggestions for their use and management are given. To find the capability classification for any given mapping unit, refer to the "Guide to Mapping Units."

DRYLAND CAPABILITY UNIT IIe-1

This unit consists of deep, nearly level clay loams and loams. Permeability is moderate. Available water capacity is high. The hazard of soil blowing is slight.

Grain sorghum and wheat are the main crops. Some forage sorghum and alfalfa also are grown.

Management practices are needed that maintain and improve tilth and control erosion. Cropping systems that include wheat, grain sorghum, alfalfa, and tame pasture are well suited to these soils. The management of residue helps to control soil blowing. If crop residue is inadequate to control soil blowing, surface-roughening tillage should be used.

DRYLAND CAPABILITY UNIT IIe-2

This unit consists only of Tipton loam, 1 to 3 percent slopes. This soil is deep. Permeability is moderate. Available water capacity is high. The hazards of soil blowing and water erosion are slight.

Grain sorghum and wheat are the main crops. Some forage sorghum, alfalfa, and tame pasture also are grown.

Management practices are needed that maintain and improve tilth, control erosion, and conserve moisture. Cropping systems that include wheat and sorghum are well suited to improving tilth, controlling soil blowing, and reducing runoff. If crop residue is inadequate to control soil blowing, surface-roughening tillage should be used. Terraces and contour farming are needed to control water erosion. Diversion terraces and grassed waterways help to control runoff.

DRYLAND CAPABILITY UNIT IIe-3

This unit consists only of Altus fine sandy loam, 0 to 1 percent slopes. This soil is deep. Permeability is moderate. Available water capacity is medium. The hazard of soil blowing is slight.

Grain sorghum and wheat are the main crops. Some alfalfa, forage sorghum, and tame pasture are also grown.

Management practices are needed that maintain or improve tilth and control erosion. Cropping systems that include alfalfa, sorghum, wheat, or tame pasture help to maintain tilth. The management of sorghum and wheat residue helps to control soil blowing. If crop residue is inadequate to control soil blowing, surface-roughening tillage should be used.

DRYLAND CAPABILITY UNIT IIIe-1

This unit consists only of Pullman silty clay loam, 1 to 3 percent slopes. This soil is deep, but the clay subsoil impedes movement of water, air, and roots. Permeability is very slow. Available water capacity is high. The hazard of water erosion is moderate. If the surface is left unprotected, a crust forms after heavy rains.

Grain sorghum and wheat are the main crops. Small acreages of forage sorghum are also grown.

Management practices are needed that maintain tilth, control erosion, and conserve moisture. The management of residue from sorghum and wheat helps to control erosion, conserve moisture, and maintain tilth. If crop residue is inadequate to prevent soil blowing, surface-roughening tillage should be used. Terraces, contour farming, and grassed waterways also help to control water erosion and to reduce runoff.

DRYLAND CAPABILITY UNIT IIIe-2

This unit consists of deep, nearly level and gently sloping soils. Permeability is slow to moderate. Available water capacity is high to medium. The hazard of soil blowing is slight, and the hazard of water erosion is slight or moderate. If the surface is not protected, a crust forms after heavy rains.

Grain sorghum and wheat are the main crops. Some alfalfa and forage sorghum also are grown.

Management practices are needed that maintain tilth, control erosion, and conserve moisture. Proper management of residue from wheat and sorghum (fig. 20) maintains tilth and reduces soil blowing to a minimum. If crop residue is inadequate to control soil blowing, surface-roughening tillage should be used. Terraces, contour farming, and diversions and grassed waterways may be needed to control water erosion and to increase the amount of water that soaks into the ground.

[2] By ALLEN H. KING, conservation agronomist, Soil Conservation Service.

Figure 20.—**Wheat straw remaining on the surface of an Acuff loam following a second tillage operation.**

DRYLAND CAPABILITY UNIT IIIe-3

This unit consists only of Darrouzett silty clay loam, 0 to 1 percent slopes. This soil is deep. Permeability is moderately slow. Available water capacity is high. The hazard of soil blowing is slight. The silty clay loam surface layer may crust after heavy rains if it is not protected.

Grain sorghum and wheat are the main crops. Some forage sorghum also is grown.

Management practices are needed that maintain and improve tilth, control erosion, and conserve moisture. Cropping systems that include sorghum and wheat, along with the management of crop residue, are effective. If residue is inadequate to control soil blowing, surface-roughening tillage should be used.

DRYLAND CAPABILITY UNIT IIIe-4

This unit consists of deep, nearly level to gently sloping soils. Permeability is moderate to moderately rapid. Available water capacity is high to medium. The hazards of soil blowing and water erosion are slight to moderate.

Wheat and grain sorghum are the main crops. Some alfalfa and forage sorghum also are grown.

Management practices are needed that maintain tilth, control erosion, and conserve moisture. The management of residue from sorghum and wheat helps to control soil blowing and maintain tilth. If crop residue is not sufficient to control soil blowing, surface-roughening tillage should be used. Contour farming and terracing help to control water erosion and to reduce runoff. In some places grassed waterways may be needed for terrace outlets.

DRYLAND CAPABILITY UNIT IIIe-5

This unit consists only of Pullman silty clay loam, 0 to 1 percent slopes. This soil is deep, but the clay subsoil may impede movement of water, air, and roots. Permeability is very slow. Available water capacity is high. The hazard of soil blowing is slight. If the surface is left unprotected, a crust forms after heavy rains.

Grain sorghum and wheat are the main crops. Some forage sorghum also is grown.

Management practices are needed that maintain tilth, control erosion, and conserve moisture. The management of residue from sorghum and wheat helps to control soil blowing, maintain tilth, and conserve moisture. If crop residue is inadequate to control soil blowing, surface-roughening tillage should be used.

DRYLAND CAPABILITY UNIT IIIe-6

This unit consists only of Mobeetie fine sandy loam, 1 to 3 percent slopes. This soil is deep. Permeability is moderately rapid. Available water capacity is medium. The hazard of soil blowing is moderate, and the hazard of water erosion is slight.

Forage sorghum and wheat are the main crops. Some tame pasture and grain sorghum are also grown.

Management practices are needed that maintain tilth, conserve moisture, and control erosion. A cropping system that includes wheat and sorghum and careful management of crop residue help to control erosion, maintain tilth, and conserve moisture. If crop residue is inadequate to control soil blowing, surface-roughening tillage should be used. Contour farming and terracing help to control water erosion and reduce

runoff. Grassed waterways may be needed for terrace outlets.

DRYLAND CAPABILITY UNIT IIIe-7

This unit consists only of Paloduro loam, 0 to 1 percent slopes. This soil is deep. Permeability is moderate. Available water capacity is high. The hazard of soil blowing is slight.

Grain sorghum and wheat are the main crops. Some forage sorghum and alfalfa also are grown.

Management practices are needed that maintain and improve tilth and control erosion. Cropping systems that include wheat, grain sorghum, alfalfa, and tame pasture are well suited to these soils. The management of residue helps to improve tilth and control soil blowing. If crop residue is inadequate to control soil blowing, surface-roughening tillage should be used.

DRYLAND CAPABILITY UNIT IIIe-8

This unit consists only of Grandfield fine sandy loam, 3 to 5 percent slopes. This soil is deep. Permeability is moderate. Available water capacity is medium. The hazards of soil blowing and water erosion are moderate.

Grain sorghum, wheat, and forage sorghum are the main crops. Some tame pasture also is grown.

Management practices are needed that maintain tilth, control erosion, and conserve moisture. Cropping systems that include wheat and sorghum provide growing cover and adequate residue to help to control soil blowing and water erosion. If residue is inadequate to control soil blowing, surface-roughening tillage should be used. Contour farming and terracing are also needed to reduce runoff and control erosion. Grassed waterways and diversions are needed in some places to provide safe outlets for runoff.

DRYLAND CAPABILITY UNIT IVe-1

This unit consists only of Acuff loam, 3 to 5 percent slopes. This soil is deep. Permeability is moderate. Available water capacity is high. The hazard of soil blowing is slight, and the hazard of water erosion is moderate.

Grain sorghum and wheat are the main crops. A small acreage of forage sorghum also is grown.

Management practices are needed that maintain tilth, control erosion, and conserve moisture. Proper management of residue from sorghum and wheat maintains tilth, holds soil blowing to a minimum, and slows runoff of rainwater so that more water soaks into the ground. If residue is not sufficient to control soil blowing, surface-roughening tillage should be used. Terraces, contour farming, and diversions and grassed waterways may be needed to control water erosion.

DRYLAND CAPABILITY UNIT IVe-2

This unit consists of deep, gently sloping soils. Permeability is moderate. Available water capacity is medium. The hazard of soil blowing is slight, and the hazard of water erosion is moderate.

Grain sorghum, forage sorghum, and wheat are the main crops grown on the soil of this unit.

Management practices are needed that maintain tilth, conserve water, and control erosion. Cropping systems should include wheat, grain sorghum, and forage sorghum. Properly managing the residue from these crops will maintain tilth, minimize erosion, and conserve moisture. If residue is not sufficient to control soil blowing, surface-roughening tillage should be used. Contour farming and terracing also are needed to reduce water erosion and to slow runoff.

DRYLAND CAPABILITY UNIT IVe-3

This unit consists only of Mobeetie fine sandy loam, 3 to 5 percent slopes. This soil is deep. Permeability is moderately rapid. Available water capacity is medium. The hazards of water erosion and soil blowing are moderate.

Wheat and forage sorghum are the main crops. Some grain sorghum also is grown.

Management practices are needed that maintain tilth, conserve moisture, and control erosion. Wheat and sorghum should be grown continuously to provide growing cover and adequate residue for the control of soil blowing and water erosion. If residue is not sufficient to control soil blowing, surface-roughening tillage should be used. Contour farming and terraces are also needed to reduce runoff and to control erosion. Grassed waterways and diversion terraces may be needed to provide safe outlets for runoff.

DRYLAND CAPABILITY UNIT IVe-4

This unit consists of deep, gently sloping soils. Permeability is moderate. Available water capacity is high to medium. The hazard of soil blowing is slight, and the hazard of water erosion is moderate.

Grain sorghum, wheat, and forage sorghum are the main crops. Some tame pasture also is grown.

Management practices are needed that maintain tilth, control erosion, and conserve moisture. Sorghum and wheat should be grown continuously to provide growing cover and adequate residue for the control of soil blowing and water erosion. If residue is not sufficient to control soil blowing, surface-roughening tillage should be used. Contour farming and terracing are needed to reduce runoff and to control water erosion. Grassed waterways and diversions are sometimes needed to provide safe outlets for runoff from terraces or other sources.

DRYLAND CAPABILITY UNIT IVe-5

This unit consists only of Springer loamy fine sand, 0 to 3 percent slopes. This soil is deep. Permeability is moderately rapid. Available water capacity is low. The hazard of soil blowing is high.

Forage sorghum and wheat are the main crops. Some grain sorghum, tame pasture, and alfalfa also are grown.

Management practices are needed that maintain tilth and control erosion. Cropping systems that include fertilized grain sorghum, wheat, and forage sorghum and management of residue are well suited to maintaining tilth and controlling erosion. If residue is not sufficient to control soil blowing, surface-roughening tillage should be used.

DRYLAND CAPABILITY UNIT IVe-6

This unit consists of deep, gently sloping soils. Permeability is moderately slow. Available water capacity

is high. The hazard of soil blowing is slight, and the hazard of water erosion is high. If the surface is not protected, a crust forms after heavy rains.

Grain sorghum, forage sorghum, and wheat are the main crops grown on the soils in this unit.

Management practices are needed that maintain tilth, conserve moisture, and control erosion. Properly managing crop residue will help to maintain tilth and minimize erosion. If residue is not sufficient to control soil blowing, surface-roughening tillage should be used. Terracing and contour farming are needed to control water erosion and to reduce runoff. Grassed waterways and diversions may be needed to carry off excess runoff.

DRYLAND CAPABILITY UNIT Vw-1

This unit consists only of Spur soils. These are deep soils on bottom lands that are subject to frequent flooding. Permeability is moderate. Available water capacity is high.

These soils are used mostly for range. A few areas are used for tame pasture or hay. Many kinds of wildlife use areas of these soils for food and cover.

The management of grazing of the native grasses is needed to make the best use of these soils.

DRYLAND CAPABILITY UNIT Vw-2

This unit consists only of Lincoln soils. They are deep, nearly level soils on bottom lands and are subject to frequent or occasional flooding. Permeability is rapid. Available water capacity is low. The hazard of soil blowing is high.

Most areas of these soils are used for range. In a few areas, bermudagrass is grown for hay and pasture. Many kinds of wildlife use areas of this unit for food and shelter.

The management of grazing, fertilization of hay and pasture crops, and control of brush are needed to make best use of these soils.

DRYLAND CAPABILITY UNIT Vw-3

This unit consists only of Sweetwater soils. They are deep, nearly level soils on bottom lands and are subject to occasional flooding. Permeability is moderate. Available water capacity is medium. A water table is above a depth of 3 feet most of the year.

These soils are used for range and for hay. Many kinds of wildlife use these areas for food and cover.

Fertilization and the management of grazing of the native grasses are needed to make the best use of these soils.

DRYLAND CAPABILITY UNIT VIe-1

This unit consists of deep, undulating and gently sloping to sloping soils. Permeability is moderately rapid. Available water capacity is low. The hazard of soil blowing is high.

These soils are better suited to uses other than crops. The main use of these soils is for range. Many kinds of wildlife use these soils for food and cover.

Management practices are needed that maintain or increase the numbers and maintain or improve the vigor of adapted grasses and forbs, protect the surface from soil blowing, and provide quality forage for livestock and wildlife. The management of grazing helps. Brush control may be needed. Wildlife needs should be considered in any brush control program.

DRYLAND CAPABILITY UNIT VIe-2

This unit consists of deep, sloping to strongly sloping and rolling, calcareous loams and clay loams. Permeability is moderate. Available water capacity is medium to high. The hazard of soil blowing is slight, and the hazard of water erosion is high.

These soils are well suited to range, to wildlife habitat, and to recreational uses.

Management practices are needed that maintain or increase the numbers and maintain or improve the vigor of adapted forbs and grasses, protect the soil from erosion, increase the amount of water that soaks into the ground, and provide quality forage for livestock and wildlife. The management of grazing helps.

DRYLAND CAPABILITY UNIT VIe-3

This unit consists of deep, sloping to moderately steep soils. Permeability is moderately rapid. Available water capacity is medium. The hazard of soil blowing is moderate and the hazard of water erosion is high if vegetation is removed by overgrazing, traffic, or trampling.

These soils are better suited to uses other than crops. The main use of these soils is for range. Many kinds of wildlife use these soils for food and cover.

Management practices are needed that maintain or increase the numbers and maintain or improve the vigor of adapted forbs and grasses, protect the surface from erosion, increase the amount of water that soaks into the soils, and provide quality forage for livestock and wildlife. The management of grazing helps. Brush control may be needed. Wildlife needs should be considered in any brush-control program.

DRYLAND CAPABILITY UNIT VIw-1

This unit consists only of Randall clay. This soil is deep, nearly level, and somewhat poorly drained, and it is in beds of intermittent lakes, or playas. These playas receive runoff from the surrounding areas and are flooded most years for several months at a time. The water remains until it evaporates. Permeability is very slow. Available water capacity is high. The hazard of soil blowing is moderate when the clay surface is bare and dry. The surface seals over when it is wet, and a crust forms when it is dry.

Periodic flooding makes this soil unsuitable for cultivation. The main use of this soil is for grazing. Native water-tolerant sedges, rushes, and forbs provide most of the grazing in areas of these soils. These playas are frequently used by shore birds and by migratory waterfowl.

Management practices are needed that control blowing when the soil is dry. Surface-roughening tillage is the main practice used. Sometimes lake water can be used to irrigate nearby crops, but this water is not always available for irrigation or for livestock. The digging of pit-type ponds increases the length of time that a lake can be used as a source of water by livestock and wildlife. Western wheatgrass and buffalograss become temporarily established on the lake bottom, but

they are drowned out if water floods areas of this soil for long periods.

DRYLAND CAPABILITY UNIT VIIe-1

This unit consists of deep, duned, gently sloping to steep and undulating soils. Some areas of these soils are eroded. Permeability is rapid to moderately rapid. Available water capacity is low. The hazard of soil blowing is high.

These soils are well suited to range and wildlife habitat, which are their main uses.

Management practices are needed that maintain or increase the numbers and maintain or improve the vigor of adapted forbs and grasses, protect the surface from soil blowing, and provide quality forage for livestock and wildlife. Management of grazing helps. Brush control may be needed. Wildlife needs should be considered in any brush-control program. All feasible management practices should be used that will reestablish native grasses on eroded soils to control soil blowing and to restore the soils for plant growth.

DRYLAND CAPABILITY UNIT VIIs-1

This unit consists of very shallow to shallow, gently sloping to moderately steep soils. Available water capacity is low. Much of the rainfall runs off and does not soak into the ground.

These soils are used mainly for range, but they are also used for wildlife habitat and recreation. A few areas are mined for caliche.

Management practices are needed that maintain or increase the numbers and maintain or improve the stand and vigor of adapted forbs and grasses, control erosion, increase the amount of water that soaks into the ground, and provide quality forage for livestock and wildlife. The management of grazing helps. Brush control may be needed. Wildlife needs should be considered in any brush-control program.

Irrigated Capability Units

In this section, the irrigated capability units of Lipscomb County are described, and suggestions for their use and management are given. To find the capability classification for any given mapping unit, refer to the "Guide to Mapping Units."

IRRIGATED CAPABILITY UNIT I-1

This unit consists only of Darrouzett silty clay loam, 0 to 1 percent slopes. This soil is deep. Permeability is moderately slow. Available water capacity is high.

Corn, grain sorghum, small grain, and forage sorghum are grown on this soil.

Management practices are needed that maintain and improve tilth and use water in a timely and efficient way. Use of a cropping system that includes sorghum and small grain, along with management of crop residue and proper fertilization, maintains tilth. To conserve water, a properly designed irrigation system should be used.

IRRIGATED CAPABILITY UNIT I-2

This unit consists of deep, nearly level soils. Permeability is moderate. Available water capacity is high.

Corn, grain sorghum, small grain, alfalfa, and forage sorghum are grown on the soils of this unit.

Management is needed that maintains and improves tilth and uses water in a timely and efficient way. A cropping system that includes fertilized sorghum and small grain, along with the management of crop residue, maintains tilth. To conserve water, a properly designed irrigation system should be used.

IRRIGATED CAPABILITY UNIT IIe-1

This unit consists of deep, gently sloping soils. Permeability is moderately slow. Available water capacity is high. The hazard of water erosion is moderate.

Corn, sorghum, and wheat are the main crops grown on the soils of this unit.

Management practices are needed that maintain and improve tilth and control erosion. Water should be used in a timely and efficient way. Sorghum and wheat grown in rotation and properly fertilized and the management of crop residue maintain tilth and help to control erosion. An irrigation system that supplies water to crops without waste or erosion should be used. Terraces, diversions, and grassed waterways may also be needed in some areas to control water erosion and runoff.

IRRIGATED CAPABILITY UNIT IIe-2

This unit consists of deep, gently sloping soils. Permeability is moderate. Available water capacity is high. The hazard of water erosion is moderate.

Corn, grain sorghum, small grain, forage sorghum, and alfalfa are grown on the soils of this unit.

Management practices are needed that maintain and improve tilth and control erosion. Water should be used in a timely and efficient way. A cropping system that includes properly fertilized sorghum, small grain, or alfalfa, along with management of crop residue, maintains tilth and helps to control erosion. An irrigation system that supplies water to crops without waste or erosion should be used. Terraces, diversions, and grassed waterways may also be needed to control water erosion and runoff.

IRRIGATED CAPABILITY UNIT IIe-3

This unit consists of deep, nearly level to gently sloping soils. Permeability is moderate to moderately rapid. Available water capacity is medium. The hazard of soil blowing is moderate.

Sorghum, small grain, and alfalfa are grown on the soils of this unit.

Management practices are needed that maintain tilth, control soil blowing, and use water in a timely and efficient way. A cropping system that includes fertilized sorghum, small grain, or alfalfa, along with management of crop residue, maintains tilth and controls soil blowing. If residue is inadequate to control soil blowing, surface-roughening tillage should be used. To conserve water, a properly designed irrigation system should be used.

IRRIGATED CAPABILITY UNIT IIs-1

This unit consists of Pullman silty clay loam, 0 to 1 percent slopes. This soil is deep, but the clay subsoil

impedes the movement of roots, air, and water. Permeability is very slow. Available water capacity is high.

Small grain, sorghum, and corn are the main crops.

Management practices are needed that maintain or improve tilth and use water in a timely and efficient way. Cropping systems that compensate for inherent soil limitations should be used. An irrigation system should be used that will apply water to meet crop needs and prevent waste of water and soil.

IRRIGATED CAPABILITY UNIT IIIe-1

This unit consists of Pullman silty clay loam, 1 to 3 percent slopes. This soil is deep, but the clay subsoil impedes the movement of roots, air, and water. Permeability is very slow. Available water capacity is high. The hazard of water erosion is moderate.

Forage sorghum, grain sorghum, small grain, and corn are the main crops. Some grasses for pasture also are grown.

Management practices are needed that control erosion and maintain and improve tilth. Water should be used in a timely and efficient way. Crops such as small grain and sorghum should be closely planted or drilled and fertilized. Crop residue should be kept on the surface to help to control erosion and eventually be incorporated into the surface to maintain tilth. A properly designed irrigation system should be used. Terraces, diversions, and grassed waterways also may be needed in some areas to control water erosion and runoff.

IRRIGATED CAPABILITY UNIT IIIe-2

This unit consists of deep, nearly level to gently sloping soils. Permeability is moderate to moderately slow. Available water capacity is high to medium. The hazard of soil blowing is slight, and the hazard of water erosion is slight to moderate.

Corn, sorghum, small grain, and alfalfa are grown on the soils of this unit.

Management practices are needed that maintain or improve tilth, control erosion, and use water in a timely and efficient way. Fertilization, rotation of crops, timely tillage, and management of residue help to protect and improve the soil. Irrigation water should be applied through a properly designed system. Terraces, diversions, and grassed waterways also may be needed in some areas to control water erosion and runoff.

IRRIGATED CAPABILITY UNIT IIIe-3

This unit consists of deep, gently sloping soils. Permeability is moderate. Available water capacity is high to medium. The hazards of soil blowing and water erosion are slight to moderate.

Sorghum, corn, small grain, and alfalfa are the main crops grown on the soils of this unit.

Management practices are needed that maintain or improve tilth, control erosion, and use water in a timely and efficient way. Crops grown in a rotation, fertilized, and managed for protection and improvement of the soils help to control soil blowing and maintain tilth. If residue is inadequate to control soil blowing, surface-roughening tillage should be used. A property designed sprinkler irrigation system should be used to distribute water evenly. Terraces, diversions, and grassed waterways also may be needed in some areas to control water erosion and runoff.

IRRIGATED CAPABILITY UNIT IIIe-4

This unit consists only of Mobeetie fine sandy loam, 1 to 3 percent slopes. This soil is deep. Permeability is moderately rapid. Available water capacity is medium. The hazard of water erosion is slight, and the hazard of soil blowing is moderate.

Sorghum, small grain, alfalfa, and tame pasture are the main crops.

Management practices are needed that maintain and improve tilth, control erosion, and use water in a timely and efficient way. Rotation of crops, use of fertilizer, careful management of irrigation water in a well-planned irrigation system, and return to crop residue to the soil help. If crop residue is inadequate to control soil blowing, surface-roughening tillage should be used. Diversions and grassed waterways may be needed to control water erosion and runoff.

IRRIGATED CAPABILITY UNIT IIIe-5

This unit consists of deep, gently sloping soils. Permeability is moderate. Available water capacity is medium. The hazard of soil blowing is slight, and the hazard of water erosion is moderate.

Small grain and sorghum are the main crops. Some alfalfa and tame pasture also are grown.

Management practices are needed that maintain and improve tilth and control erosion. Water should be used in a timely and efficient way. Cropping systems that compensate for inherent soil limitations should be used. Crop rotation, fertilization, and use of crop residue help to control erosion and improve tilth. Irrigation water should be applied through a properly designed system. Grassed waterways and diversion terraces may be needed to control runoff and water erosion.

IRRIGATED CAPABILITY UNIT IIIe-6

This unit consists only of Acuff loam, 3 to 5 percent slopes. Permeability is moderate. Available water capacity is high. The hazard of water erosion is moderate to moderately high.

Grain sorghum, forage sorghum, corn, and wheat are the main crops.

Management practices are needed that maintain or improve tilth and control erosion. Water should be used in a timely and efficient way. Use of residue from small grain and sorghum, which should be properly fertilized and grown in rotation, maintains tilth. Irrigation water should be applied through a properly designed system. Diversion terraces and grassed waterways can be useful to control runoff.

IRRIGATED CAPABILITY UNIT IIIe-7

This unit consists of Grandfield fine sandy loam, 3 to 5 percent slopes. This soil is deep. Permeability is moderate. Available water capacity is medium. The hazards of water erosion and soil blowing are moderate.

Sorghum and small grain are the main crops.

Management practices are needed that maintain or improve tilth, control erosion, and use water in a timely

and efficient way. Use of residue from sorghum or small grain that is adequately fertilized maintains tilth and protects the soil from erosion. If residue is not sufficient to control soil blowing, surface-roughening tillage should be used. Irrigation water should be applied through a properly designed system. Diversion terraces and grassed waterways may be needed to control runoff.

IRRIGATED CAPABILITY UNIT IVe-1

This unit consists of Mobeetie fine sandy loam, 3 to 5 percent slopes. This soil is deep. Permeability is moderately rapid. Available water capacity is medium. The hazards of soil blowing and water erosion are moderate.

Wheat and forage sorghum are the main crops. Some tame pasture and grain sorghum also are grown.

Management practices are needed that maintain or improve tilth, control erosion, and use water in a timely and efficient way. Residue from small grain and sorghum that are fertilized and grown in a rotation helps to control erosion and improve tilth. If residue is not sufficient to control soil blowing, surface-roughening tillage should be used. Irrigation water should be applied through a properly designed system. Diversion terraces and grassed waterways may be needed to control excess runoff.

IRRIGATED CAPABILITY UNIT IVe-2

This unit consists of deep, gently sloping soils. Permeability is moderate. Available water capacity is high to medium. The hazard of water erosion is moderate.

Small grain, sorghum, alfalfa, and tame pasture are the main crops grown on the soils of this unit.

Management practices are needed that maintain and improve tilth, use water in a timely and efficient way, and control erosion. Residue from such crops as wheat and grain sorghum grown in rotation, fertilized, and managed for erosion control help to maintain tilth. Irrigation water should be applied through a properly designed sprinkler system. Terraces are needed to control runoff and water erosion. Diversions and grassed waterways are needed to carry away excess runoff.

IRRIGATED CAPABILITY UNIT IVe-3

This unit consists only of Springer loamy fine sand, 0 to 3 percent slopes. This soil is deep. Permeability is moderately rapid. Available water capacity is low. The hazard of soil blowing is high.

Small grain, sorghum, alfalfa, and tame pasture are the main crops.

Management practices are needed that control erosion, maintain tilth, and use water in a timely and efficient way. Residue from close-planted or drilled, fertilized crops helps to protect the soil from blowing. If residue is not sufficient to control soil blowing, surface-roughening tillage should be used. Water should be supplied through a sprinkler system.

Predicted Yields

Predicted yields are shown in table 2 for the main soils that are used for crops. Estimates are given only for the level of management necessary to attain high yields. In the following paragraphs the principal soil, plant, and water management practices that contribute to high yields are given.

In the management of dryland soils, the following practices are needed:

1. Precipitation is conserved.
2. Crops are rotated. Close-growing and soil-protecting crops are alternated with clean-tilled and erosion-permitting crops.
3. Residue from crops is left on the surface at least when the hazard of erosion is great.
4. Soil tillage is timely and held to a minimum.
5. Terraces, diversions, and grassed waterways are used where needed. Contour farming follows terraces and guidelines.

In the management of irrigated soils, the following practices are needed:

1. Precipitation is conserved.
2. Crops are rotated. Soil-protecting and soil-improving crops are alternated with clean-tilled and erosion-permitting crops.
3. Fertilizers are used to meet crop needs.
4. Residue from crops is kept on or near the surface when the hazard of erosion is great.
5. Soil tillage is timely and held to a minimum.
6. An irrigation system is installed to utilize irrigation water efficiently without waste or erosion.
7. Irrigation water is applied in accordance with soil characteristics and crop growth requirements.

Range[3]

Ranching and livestock farming are important enterprises in Lipscomb County. About 421,433 acres, or approximately 71 percent of the county, is native grassland. About 100 ranching units are in the county. They range from 700 acres to 14,000 acres in size. The average size is about 5,000 acres. On most of the ranches, some areas are cropped. The range is mainly in the southern two-thirds and the north-central part of the county. Grass production usually is good except in years that have below average rainfall. The average rainfall in the county is 21.57 inches.

Both cow and calf and stocker cattle operations are practiced in Lipscomb County. Although the feeding of stocker cattle is increasing in the county, most ranchers apply management practices suited to cow and calf operations. Some ranchers include stocker cattle with their cowherds. Wheat or forage sorghum is used for grazing. Several thousand stocker cattle are brought in annually to graze wheatfields from November through April or May. These stocker cattle are then sold or placed in feedlots for finishing. One commercial feedlot that has a capacity of about 5,000 head is in the county, and several smaller feedlots are on various ranches.

Supplemental feeding begins early in winter and extends into spring. The livestock usually are fed only

[3] By JOHN A. WRIGHT, range conservationist, Soil Conservation Service.

TABLE 2.—*Predicted average acre yields of principal dryland and irrigated crops on arable soils*

[Absence of a yield figure indicates that the crop is not commonly grown on the soil]

Soil	Dryland		Irrigated			
	Grain sorghum	Wheat	Grain sorghum	Wheat	Alfalfa for hay	Forage sorghum
	Lb	*Bu*	*Lb*	*Bu*	*Tons*	*Tons*
Acuff loam, 1 to 3 percent slopes	1,250	15	6,500	55	6.0	21
Acuff loam, 3 to 5 percent slopes	1,000	14	3,200	30		
Altus fine sandy loam, 0 to 1 percent slopes	2,500	20	6,250	60	6.0	18
Berda loam, 1 to 3 percent slopes	1,250	12	5,000	45		18
Bippus clay loam, 0 to 1 percent slopes	1,500	15	6,250	55	6.0	22
Bippus clay loam, 1 to 3 percent slopes	1,250	15	5,500	50	6.0	20
Bippus fine sandy loam, 1 to 3 percent slopes	1,500	15	6,000	50	6.0	16
Darrouzett silty clay loam, 0 to 1 percent slopes	1,500	15	6,500	55	5.5	22
Darrouzett silty clay loam, 1 to 3 percent slopes	1,250	15	5,500	50	5.0	16
Darrouzett silty clay loam, 3 to 5 percent slopes	1,000	10				
Estacado silty clay loam, 1 to 3 percent slopes	1,250	15	4,750	45	5.0	18
Estacado-Olton complex, 0 to 3 percent slopes	1,250	15	6,000	50	5.5	21
Grandfield fine sandy loam, 1 to 3 percent slopes	1,600	20	6,000	50	6.0	16
Grandfield fine sandy loam, 3 to 5 percent slopes	1,250	15	4,500	40	5.0	14
Guadalupe fine sandy loam	1,750	16	6,250	60	6.0	18
Mansker loam, 1 to 3 percent slopes	900	12	3,500	35	4.0	12
Mobeetie fine sandy loam, 1 to 3 percent slopes	1,250	15	4,500	45	4.0	12
Mobeetie fine sandy loam, 3 to 5 percent slopes	1,000	10	3,500	35		10
Olton clay loam, 1 to 3 percent slopes	1,250	15	6,000	50	5.0	16
Olton clay loam, 3 to 5 percent slopes	750	10				
Paloduro loam, 0 to 1 percent slopes	1,500	15	5,500	55	5.5	20
Paloduro loam, 1 to 3 percent slopes	1,250	15	5,000	50	5.0	18
Paloduro loam, 3 to 5 percent slopes	750	10	3,500	40		12
Paloduro, Veal, and Portales soils, 3 to 5 percent slopes	750	10	3,500	40		10
Portales clay loam, 1 to 3 percent slopes	1,250	15	5,500	55	5.5	18
Pullman silty clay loam, 0 to 1 percent slopes	900	14	6,500	55	5.5	22
Pullman silty clay loam, 1 to 3 percent slopes	750	13	5,750	45	5.0	16
Springer loamy fine sand, 0 to 3 percent slopes	1,000	10	4,500	40	5.0	15
Tipton loam, 0 to 1 percent slopes	1,500	16	6,250	60	6.0	22
Tipton loam, 1 to 3 percent slopes	1,500	15	6,000	55	5.5	20
Veal loam, 1 to 3 percent slopes	1,000	12	3,500	40		12
Veal loam, 3 to 5 percent slopes	750	10	3,000	35		10

protein concentrates, but during severe snowstorms they are also fed hay.

Several types of range are in the county. The hardland type, which primarily produces short and mid grasses, is the most abundant. These range sites are mostly in the northern part of the county. Sandyland and sandy loam types are in the southern and eastern parts of the county and grow tall grasses. There are small areas of shallow soils that produce only sparse vegetation.

Range sites and condition classes

A range site is a distinctive kind of range that differs from other kinds of range in the potential to produce native plants. Range sites differ from each other in their capacity to produce significantly different kinds or proportions of plant species or in their total annual production. A significant difference is one great enough to require some variation in management, such as stocking a site with different numbers of cattle.

The differences in kinds, proportion, and production of plants on different sites are due in large measure to differences in environmental factors such as soil, topography, and climate. Therefore, a range site can be identified by the kinds of soil known to be capable of producing the distinctive potential plant community that characterizes that site.

The stabilized plant community on a particular site that reproduces itself and does not change as long as the environment does not change is the climax plant community.

Most of the native grasslands of Lipscomb County have been heavily grazed for several generations, and their original plant cover has been materially altered. Range condition is the present state of the vegetation of a range site in relation to the potential plant cover for that site. Range condition classes measure the degree to which the present plant composition, expressed as a percentage, resembles that of the potential plant community of a range site. Four range condition classes are recognized.

A range is in *excellent condition* if 76 to 100 percent of the composition of the present plant community is the same as the potential plant community. It is in *good condition* if the percentage is 51 to 75 percent; *fair condition* if 26 to 50 percent; and *poor condition* if 25 percent or less.

For most range sites and most range livestock operations, the higher the range condition class, the better the quality and the greater the amount of available forage.

Descriptions of the range sites

In Lipscomb County nine range sites have been identified. The following descriptions discuss the soils,

the composition of the climax plant community, site recovery practices, and production of herbage.

DEEP HARDLAND RANGE SITE

The soils of this range site are deep and nearly level to gently sloping. They are moderately permeable to very slowly permeable. In some places the intake of moisture is reduced by surface crusting and by a compacted layer caused by trampling.

The approximate composition of the climax plant community, by percentage of total weight, is 60 percent blue grama, 15 percent buffalograss, 5 percent vine-mesquite, 5 percent western wheatgrass, 5 percent side-oats grama, 5 percent silver bluestem, and 5 percent annual forbs.

The recovery of deteriorated areas in this site can be helped by reseeding to desirable grasses and then deferring grazing.

If this site is in excellent condition, the total annual production of air-dry herbage ranges from 1,200 pounds per acre in unfavorable years to 2,200 pounds per acre in favorable years. About 95 percent of this vegetation is suitable for use by livestock and wildlife.

DEEP SAND RANGE SITE

The soils of this range site are deep and gently sloping to steep and occur in duned areas. These soils are rapidly permeable.

The approximate composition of the climax plant community, by percentage of the total weight, is 15 percent little bluestem, 15 percent sand bluestem, 15 percent side-oats grama, 10 percent indiangrass, 10 percent switchgrass, 10 percent sand lovegrass, 10 percent woody plants, 5 percent three-awns, 5 percent sand dropseed, and 5 percent big sandreed.

Under heavy grazing, the plant cover deteriorates rapidly. The vegetation responds to good grazing management. The recovery of deteriorated areas in this site can be helped by reseeding the soils or controlling brush and then deferring grazing.

If this site is in excellent condition, the total annual production of air-dry herbage ranges from 1,400 pounds per acre in unfavorable years to 2,000 pounds per acre in favorable years. About 90 percent of this vegetation is suitable for use by livestock and wildlife.

HARDLAND SLOPES RANGE SITE

The soils of this range site are deep and nearly level to strongly sloping and rolling. They are moderately permeable.

The approximate composition of the climax plant community, by percentage of the total weight, is 40 percent side-oats grama, 20 percent blue grama, 15 percent little bluestem, 5 percent buffalograss, 5 percent three-awns, 5 percent sand dropseed, 5 percent annual grasses, and 5 percent annual forbs.

The recovery of deteriorated areas in this site can be helped by reseeding and by deferring grazing.

If this site is in excellent condition, the total annual production of air-dry herbage ranges from 1,300 pounds per acre in unfavorable years to 2,300 pounds per acre in favorable years. About 90 percent of this vegetation is suitable for use by livestock and wildlife.

LOAMY BOTTOMLAND RANGE SITE

The soils of this range site are deep and nearly level to gently sloping and occur on flood plains along streams. The soils are moderately permeable to moderately rapidly permeable. Areas of these soils receive runoff water from adjacent hillside slopes. Some of these areas are subject to flooding and sediment deposition.

Vegetation is lush where the soils have a high water table. Stocking rates can be higher in these areas of extra herbage.

The approximate composition of the climax plant community, by percentage of the total weight, is 20 percent switchgrass, 15 percent indiangrass, 10 percent sand bluestem, 10 percent little bluestem, 10 percent blue grama, 10 percent side-oats grama, 10 percent western wheatgrass, 5 percent Canada wildrye, 5 percent alkali sacaton, and 5 percent woody plants.

The recovery of deteriorated areas in this site can be helped by reseeding and then deferring grazing. Seeding, however, commonly is not feasible in areas that are subject to flooding or that have a high water table.

If this site is in excellent condition, the total annual production of air-dry herbage ranges from 2,000 pounds per acre in unfavorable years to 4,000 pounds per acre in favorable years. About 95 percent of this vegetation is suitable for use by livestock and wildlife.

MIXEDLAND SLOPES RANGE SITE

The soils of this range site are deep and gently sloping to moderately steep, and they occur on uplands. The soils are moderately rapidly permeable.

The approximate composition of the climax plant community, by percentage of the total weight, is 30 percent side-oats grama, 25 percent little bluestem, 20 percent blue grama, 5 percent sand bluestem, 5 percent buffalograss, 5 percent sand dropseed, 5 percent sand sagebrush, and 5 percent annuals.

The recovery of deteriorated areas in this site can be helped by seeding and by deferring grazing. Areas of these soils in which sand sage has invaded can be improved by controlling brush and then deferring grazing.

If this site is in excellent condition, the total annual production of air-dry herbage ranges from 1,600 pounds per acre in unfavorable years to 2,200 pounds per acre in favorable years. About 90 percent of this vegetation is suitable for use by livestock and wildlife.

SANDY BOTTOMLAND RANGE SITE

The soils of this range site are sandy, deep, and nearly level, and they occur on flood plains along streams and creeks. These soils are rapidly permeable. In some areas the water table is at a depth of 4 to 10 feet. Some areas are subject to occasional flooding.

The approximate composition of the climax plant community, by percentage of the total weight, is 25 percent switchgrass, 20 percent indiangrass, 15 percent sand bluestem, 10 percent little bluestem, 10 percent woody plants, 5 percent side-oats grama, 5 percent Canada wildrye, 5 percent sedges, and 5 percent annuals.

The recovery of deteriorated areas in this site can be helped by reseeding to desirable grasses and then de-

ferring grazing. The value of seeding is successful only part of the time in areas that are subject to flooding.

If this site is in excellent condition, the total annual production of air-dry herbage in areas that have a high water table ranges from 2,200 pounds per acre in unfavorable years to 3,000 pounds per acre in favorable years. About 90 percent of this vegetation is suitable for use by livestock and wildlife.

SANDYLAND RANGE SITE

The soils of this range site are deep, sandy, and nearly level to sloping and undulating. They are moderately rapidly permeable.

The approximate composition of the climax plant community, by percentage of the total weight, is 20 percent little bluestem, 15 percent sand bluestem, 10 percent indiangrass, 10 percent switchgrass, 10 percent side-oats grama, 10 percent woody plants, 10 percent annuals, 5 percent sand lovegrass, 5 percent blue grama, and 5 percent three-awns.

The recovery of deteriorated areas in this site can be helped by seeding under most conditions and by controlling brush and deferring grazing if conditions are less severe.

If the site is in excellent condition, the total annual production of air-dry herbage ranges from 1,500 pounds per acre in unfavorable years to 3,000 pounds per acre in favorable years. About 90 percent of this vegetation is suitable for use by livestock and wildlife.

SANDY LOAM RANGE SITE

The soils of this range site are deep and nearly level to gently sloping, and they occur on plains (fig. 21). These soils are moderately permeable. They often are affected by surface crusting and hoof pans if they are not protected by plant cover.

The approximate composition of the climax plant community, by percentage of the total weight, is 20 percent side-oats grama, 15 percent blue grama, 10 percent little bluestem, 10 percent switchgrass, 10 percent annual forbs, 5 percent sand bluestem, 5 percent indiangrass, 5 percent Canada wildrye, 5 percent buffalograss, 5 percent sand dropseed, 5 percent woody plants, and 5 percent annual grasses.

The recovery of deteriorated areas in this site can be helped by interseeding to desirable grasses. Areas in which sand sage has invaded can be improved by controlling brush and then deferring grazing.

If this site is in excellent condition, the total annual production of air-dry herbage ranges from 1,800 pounds per acre in unfavorable years to 2,500 pounds per acre in favorable years. About 90 percent of this vegetation is suitable for use by livestock and wildlife.

VERY SHALLOW RANGE SITE

The soils of this range site are very shallow to shallow and rolling, and they occur on ridges and knobs, along caprock escarpments, and on convex areas. These soils are moderately permeable. Caliche, gravel, or rock is exposed in many places.

The approximate composition of the climax plant community, by percentage of the total weight, is 30 percent side-oats grama, 20 percent little bluestem, 10 percent blue grama, 5 percent switchgrass, 5 percent dotted gayfeather, 5 percent hairy grama, 5 percent three-awns, 5 percent rough tridens, 5 percent sand bluestem, 5 percent woody plants, and 5 percent annuals.

The recovery of deteriorated areas in this site can be helped by deferring grazing.

If this site is in excellent condition, the total annual production of air-dry herbage ranges from 400 pounds per acre in unfavorable years to 850 pounds per acre in favorable years. About 90 percent of this vegetation is suitable for use by livestock and wildlife.

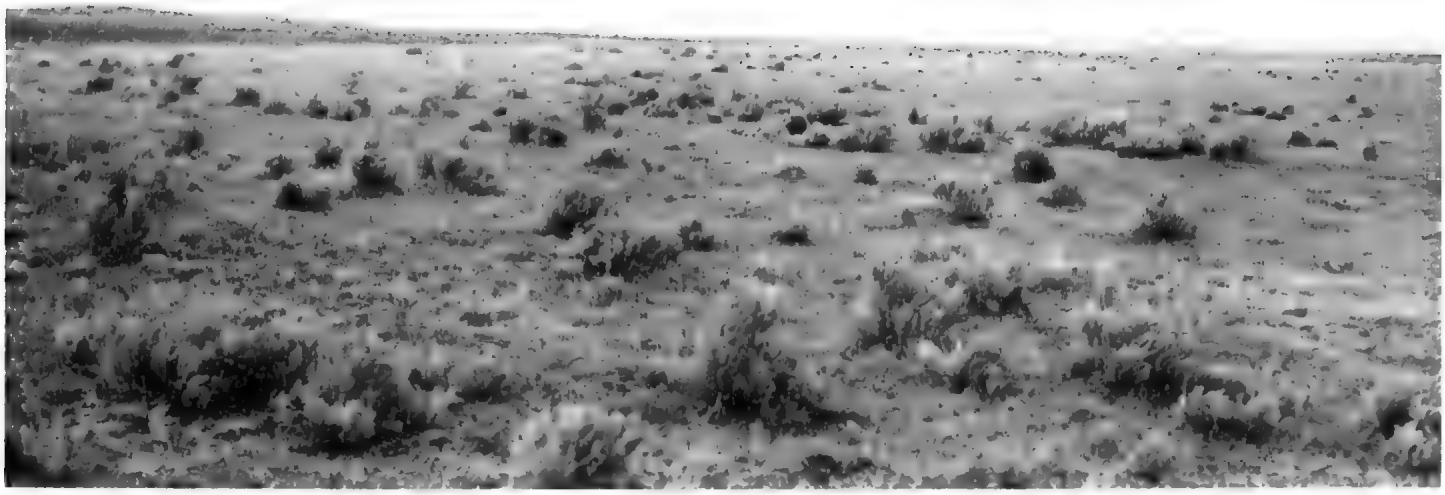

***Figure 21.*—Area of a Grandfield fine sandy loam on Sandy Loam range site.**

Wildlife[4]

In Lipscomb County there is a wide variety of wildlife habitats. Game birds such as bobwhite quail, scaled quail, mourning dove, prairie chicken, and ring-necked pheasant may be found in the open and brushy range areas and areas where crops are grown. White-tailed deer and turkey are found in the sandy and rough, broken areas along the major drainageways and creeks. Pronghorn antelope are found in the plains areas. Other animals found in the county are coyotes, bobcats, badgers, raccoons, beaver, jackrabbits, cottontail rabbits, skunks, opossums, and prairie dogs.

Many species of nongame birds are in the county.

Farm ponds supply habitat for water birds and shore birds as well as for various fish.

Income from the leasing of areas for recreational hunting is becoming increasingly important to the economy of this county.

The successful management of wildlife on any tract of land requires, among other things, that food, cover, and water be available in a suitable combination. The lack of any one of these necessities, an unfavorable balance between them, or the inadequate distribution of them could severely limit the number, or account for the absence, of desirable wildlife species.

The management of most wildlife habitats requires the planting of suitable vegetation or the manipulation of existing plants to bring about the natural establishment, increase, or improvement of desirable plants. The influence of a particular soil on the growth of many plants is known or can be inferred from knowledge about the characteristics and behavior of the soil. In addition, information about soil is important for the creation or improvement of water areas as wildlife habitat.

Soil interpretations for wildlife habitat serve a variety of purposes. They aid in the selection of suitable sites for various kinds of management. They indicate the intensity of management needed to achieve satisfactory results. They indicate under what circumstances it generally is not feasible to manage a particular area for a given kind of wildlife. They serve in the broad-scale planning of wildlife management areas, of parks, and of nature areas and in the acquisition of wildlife lands.

Soil properties that affect the growth of wildlife habitat are (1) thickness of soil useful to crops, (2) surface texture, (3) available water capacity to a depth of 40 inches, (4) wetness, (5) surface stoniness or rockiness, (6) hazard of flooding, and (7) slope.

The areas of soils shown on the soil survey maps are rated without regard to their relationships to each other. The size, shape, or location of the outlined area does not affect the rating. Certain influences on habitat, such as elevation and aspect, must be appraised onsite.

In table 3 the soils of Lipscomb County are rated for the creation, improvement, or maintenance of six elements of wildlife habitat and for the support of three kinds of wildlife. These ratings are based upon limitations imposed by the characteristics or behavior of the soil. Four levels of suitability are recognized. Numerical ratings of 1 to 4 indicate the degree of soil suitability for a given habitat element.

A rating of 1 means well suited and indicates that habitat generally is easily created, improved, or maintained; that the soil has few or no limitations that affect management; and that satisfactory results can be expected.

A rating of 2 means suited and indicates that habitat can be created, improved, or maintained in most places; that the soil has moderate limitations that affect management; and that moderate intensity of management and fairly frequent attention may be required for satisfactory results.

A rating of 3 means poorly suited and indicates that habitat can be created, improved, or maintained in most places; that the soil has rather severe limitations; that habitat management is difficult and expensive and requires intensive effort; and that results are not always satisfactory. For short-term use, soils rated "poorly suited" may provide easy establishment of habitat and temporary value.

A rating of 4 means unsuited and indicates that the soil limitation is so extreme that it is impractical, if not impossible, to manage the designated habitat element. Unsatisfactory results are probable.

Definitions and examples of the six habitat elements rated in table 3 are given in the following paragraphs.

Grain and seed crops are agricultural grains or seed-producing annuals planted to produce food for wildlife. Examples are corn, sorghum, millet, soybean, wheat, barley, rye, oats, and sunflower.

Grass and legumes are domestic perennial grasses and legumes that are established by planting and that furnish food and cover for wildlife. Examples of grasses are western wheatgrass, johnsongrass, sand lovegrass, weeping lovegrass, sand dropseed, vine-mesquite, ryegrass, fescue, and switchgrass. Examples of legumes are clovers, vetch, alfalfa, quail bean, and others.

Wild herbaceous upland plants are perennial grasses, forbs, and weeds that provide food and cover for wildlife. Examples of these are beggarweed, perennial lespedeza, wildbean, Texas croton, indiangrass, wild ryegrass, wild sunflower, bluestems, and ragweed.

Hardwood trees and shrubs are nonconiferous trees, shrubs, and woody vines that produce fruits, nuts, buds, catkins, or foliage that are used extensively as food by wildlife. These plants commonly become established through natural processes, but they may be planted. Examples are mesquite, woollybucket bumelia, catclaw, cottonwood, willow, wild grape, wild plum, honeysuckle, hackberry, mulberry, and sumac.

Wetland food and cover plants are annual and perennial wild herbaceous plants in moist to wet sites, exclusive of submerged or floating aquatics, that produce food or cover that is extensively and dominantly used by wetland wildlife. Examples are smartweed, wild millet, bulrush, spikesedge, rushes, sedges, burreeds, barnyardgrass, wildrice; cutgrass, sourdock, and cattails.

Shallow water developments are low dikes and water control structures established to create habitat principally for waterfowl. They may be designed so that they can be drained, planted, and flooded, or they may be used as permanent impoundments to grow sub-

[4] By JAMES HENSON, biologist, Soil Conservation Service.

TABLE 3.—*Suitability of soils for elements of wildlife habitat and kinds of wildlife*

[A rating of 1 indicates well suited; 2, suited; 3, poorly suited; and 4, unsuited]

Soil series and map symbols	Elements of wildlife habitat						Kinds of wildlife		
	Grain and seed crops	Grass and legumes	Wild herbaceous upland plants	Hardwood trees and shrubs	Wetland food and cover plants	Shallow water developments	Open-land	Brush-land	Wetland
Acuff: AcB, AcC	1	1	1	4	4	4	1	3	4
Altus: AlA	1	1	1	4	4	4	1	3	4
Berda: BdB, BeD For Potter part of BeD, see Potter series.	1	1	1	4	4	4	1	3	4
Bippus: BrA, BrB, BuB	1	1	1	4	4	4	1	3	4
Darrouzett: DaA, DaB, DaC	1	1	1	4	4	4	1	3	4
Devol: DeD, DsC3 For Springer part of DsC3, see Springer series.	2	1	1	3	4	4	1	2	4
Estacado: EsB, EtB For Olton part of EtB, see Olton series.	1	1	1	4	4	4	1	3	4
Grandfield: GrB, GrC	1	1	1	4	4	4	1	3	4
Guadalupe: Gu	2	1	1	3	4	4	1	2	4
Likes: LkC	2	1	1	3	4	4	1	2	4
Lincoln: Ln	3	2	2	3	4	3	2	2	4
Mansker: McB	1	1	1	4	4	4	1	3	4
Mobeetie: MrB, MrC, MrD, MxD For Potter part of MxD, see Potter series.	2	1	1	4	4	4	1	3	4
Olton: OlB, OlC	1	1	1	4	4	4	1	3	4
Paloduro: PaA, PaB, PaC, PbD, PdC For Veal parts of PbD and PdC, see Veal series; for Berda part of PbD, see Berda series: for Portales part of PdC, see Portales series.	1	1	1	4	4	4	1	3	4
Portales: PoB	1	1	1	4	4	4	1	3	4
Potter: PrD	4	4	3	4	4	4	3	3	4
Pullman: PuA, PuB	1	1	1	4	4	4	1	3	4
Randall: Ra	3	4	3	2	1	1	3	3	1
Springer: SlB	2	1	1	3	4	4	1	2	4
Spur: Sp	2	1	1	3	4	4	1	2	4
Sweetwater: Sw	3	2	2	4	1	1	2	3	1
Tipton: TpA, TpB	1	1	1	4	4	4	1	3	4
Tivoli: Tv	3	2	3	3	4	4	3	3	4
Veal: VeB, VeC	1	1	1	4	4	4	1	3	4

merged aquatics. Only freshwater developments are considered.

The three general kinds of wildlife rated in table 3 are defined as follows:

Open-land wildlife consists of birds and mammals that normally frequent cropland, pastures, and areas overgrown by grasses, herbs, and shrubby growth. Examples of this kind of wildlife are antelope, quail, prairie chicken, pheasant, cottontail rabbits, jackrabbits, meadowlarks, horned larks, long-billed curlews, and sandhill cranes.

Brushland wildlife consists of birds and mammals that normally frequent shrubs and wooded areas of hardwood trees. Examples of brushland wildlife are deer, turkeys, squirrels, raccoons, and birds.

Wetland wildlife consists of birds and mammals that

normally frequent such areas as ponds, streams, ditches, marshes, and swamps. Examples of this kind of wildlife are ducks, geese, shore birds, and beaver.

Engineering Uses of the Soils[5]

This section is useful to those who need information about soils used as structural material or as foundation upon which structures are built. Among those who can benefit from this section are planning commissions, town and city managers, land developers, engineers, contractors, and farmers.

Among properties of soils highly important in engineering are permeability, compressibility, shear strength, compaction characteristics, soil drainage condition, shrink-swell potential, grain size, plasticity, and soil reaction. Also important are depth to the water table, depth to bedrock, and soil slope. These properties, in various degrees and combinations, affect construction and maintenance of roads, airports, pipelines, foundations for small buildings, irrigation systems, ponds and small dams, and systems for disposal of sewage and refuse.

Information in this section of the soil survey can be helpful to those who—

1. Select potential residential, industrial, commercial, and recreational areas.
2. Evaluate alternate routes for roads, highways, pipelines, and underground cables.
3. Seek sources of gravel, sand, or clay.
4. Plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for controlling water and conserving soil.
5. Correlate performance of existing structures with properties of the kinds of soil on which they are built so as to predict performance of structures on the same or similar kinds of soil in other locations.
6. Predict the trafficability of soils for cross-country movement of vehicles and construction equipment.
7. Develop preliminary estimates pertinent to construction in a particular area.

Most of the information in this section is presented in tables 4, 5, and 6, which show, respectively, several estimated soil properties significant to engineering; interpretations for various engineering uses; and results of engineering laboratory tests on soil samples.

This information, along with the soil map and other parts of this publication, can be used to make interpretations in addition to those given in tables 4, 5, and 6, and it also can be used to make other useful maps.

This information, however, does not eliminate the need for further investigations at sites selected for engineering works, especially works that involve heavy loads or that require excavations to depths greater than those shown in the tables, generally depths greater than 6 feet. Also, inspection of sites, especially the small ones, is needed because many delineated areas of a given soil mapping unit may contain small areas of other kinds of soil that have strongly contrasting properties and different suitabilities or limitations for soil engineering.

Some of the terms used in this soil survey have a special meaning to soil scientists that is not known to all engineers. The glossary at the end of this survey defines many of these terms commonly used in soil science.

Engineering soil classification systems

The two systems most commonly used in classifying samples of soils for engineering are the Unified soil classification system[6], used by SCS engineers, the Department of Defense and others, and the AASHO system[7], adopted by the American Association of State Highway Officials.

In the Unified soil classification system, soils are classified according to particle-size distribution, plasticity index, liquid limit, and organic-matter content. Soils are grouped in 15 classes. There are eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes are designated by symbols for both classes; for example, ML-CL.

The AASHO system is used to classify soils according to those properties that affect use in highway construction and maintenance. In this system, a soil is placed in one of seven basic groups ranging from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. In group A-1 are gravelly soils of high strength, or the best soils for subgrade (foundation). At the other extreme, in group A-7, are clay soils that have low strength when wet and that are the poorest soils for subgrade. Where laboratory data are available to justify a further breakdown, the A-1, A-2, and A-7 groups are divided as follows: A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, A-7-6. As additional refinement, the engineering value of a soil material can be indicated by a group index number. Group indexes range from 0 for the best material to 20 or more for the poorest. The AASHO classification for tested soils, with group index numbers in parentheses, is shown in table 6; the estimated classification, without group index numbers, is given in table 4 for all soils mapped in the survey area.

Estimated engineering properties

Table 4 gives estimates of physical properties that are most likely to affect engineering practices. The estimates are based on field observations made in the course of mapping, on test data given in table 6, and on comparisons with similar soils in other areas.

Soils are classified in hydrologic soil groups according to their runoff potential from rainfall. The soils are classified on the basis of intake of water at the end of long-duration storms occurring after prior wetting and opportunity for swelling and without the protective effects of vegetation. Four major soil groups are used.

[5] By JOHN W. JACKSON, agricultural engineer, Soil Conservation Service.

[6] UNITED STATES DEPARTMENT OF DEFENSE. UNIFIED SOIL CLASSIFICATION SYSTEM FOR ROADS, AIRFIELDS, EMBANKMENTS AND FOUNDATIONS. MIL-STD-619B, 30 pp., illus., 1968.

[7] AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS. STANDARD SPECIFICATIONS FOR HIGHWAY MATERIALS AND METHODS OF SAMPLING AND TESTING. Ed. 8, 2v., illus. 1961.

Group A consists of soils that have a high infiltration rate, even when thoroughly wetted, and are chiefly deep, well-drained to excessively drained sand or gravel, or both. Such soils have a high rate of water transmission and a low runoff potential.

Group B consists of soils that have a moderate infiltration rate when thoroughly wetted and are chiefly moderately deep to deep, moderately well drained to well drained, and moderately fine textured to moderately coarse textured. Such soils have a moderate rate of water transmission and a moderate runoff potential.

Group C consists of soils that have a slow rate of infiltration when thoroughly wetted, chiefly soils that have a layer that impedes the downward movement of water and soils that are moderately fine textured to fine textured. Such soils have a slow rate of water transmission and a high runoff potential.

Group D consists of soils that have a very slow rate of infiltration when thoroughly wetted, chiefly soils that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. Such soils have a very slow rate of water transmission and very high runoff potential.

Depth to seasonal high water table is the distance from the surface of the soil to the highest level that ground water reaches in the soil in most years. This is not a problem with soils of Lipscomb County. Therefore, no column for this property is included in the table. Lincoln soils have a water table at a depth of 4 to 10 feet in some places, Sweetwater soils have a water table at a depth of 20 to 36 inches in most places.

Depth to bedrock is the distance from the surface of the soil to the upper surface of the rock layer. Potter soils are 4 to 12 inches deep to fractured caliche. Other soils are many feet deep to bedrock. Therefore, no column was included in the table.

Soil texture is described in the standard terms used by the Department of Agriculture. These terms take into account the relative percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that contains 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the soil contains gravel or other particles coarser than sand, an appropriate modifier is added; for example, "gravelly loamy sand." "Sand," "silt," "clay," and some of the other terms used in USDA textural classification are defined in the Glossary at the back of this publication.

Estimates are given for a range in percentage of soil material passing sieves of four different sizes. This information is useful in helping to determine the suitability of the soil as a source of material for construction.

Permeability is that quality of a soil that enables it to transmit water or air. It is estimated on the basis of those soil characteristics observed in the field, particularly structure and texture. The estimates in table 4 do not take into account lateral seepage or such transient soil features as plowpans and surface crusts.

Available water capacity is the ability of soils to hold water for use by most plants. It commonly is defined as the difference between the amount of water in the soil at field capacity and the amount at the wilting point of most crop plants.

Reaction is the degree of acidity or alkalinity of a soil expressed in pH values. The pH value and terms used to describe soil reaction are explained in the Glossary.

Shrink-swell potential is the relative change in volume to be expected of soil material with changes in moisture content, that is, the extent to which the soil shrinks as it dries out or swells when it gets wet. Extent of shrinking and swelling is influenced by the amount and kind of clay in the soil. Shrinking and swelling of soils cause much damage to building foundations, roads, and other structures. A *high* shrink-swell potential indicates a hazard to maintenance of structures built in, on, or of material having this rating.

Engineering interpretations

The interpretations in table 5 are based on the estimated engineering properties of soils shown in table 4, on test data for soils in this survey area and other nearby or adjoining areas, and on the experience of engineers and soil scientists with the soils of Lipscomb County. In table 5, ratings are used to summarize limitation or suitability of the soils for each listed purpose except irrigation, waterways, and terraces and diversions. For these particular uses, table 5 lists soil features that should not be overlooked in planning, installation, and maintenance.

Soil limitations are indicated by the ratings slight, moderate, and severe. *Slight* means soil properties generally are favorable for the rated use, or limitations are minor and easily overcome or modified by special planning and design. *Moderate* means soil properties are favorable for the rated use. Limitations can be overcome or modified with planning, design, or special maintenance. Some of these limitations can be tolerated. *Severe* means soil properties are so unfavorable and so difficult to correct or overcome as to require major reclamation, special designs, or intensive maintenance.

Soil suitability is rated by the terms *good, fair,* and *poor,* which have, respectively, meanings approximately parallel to the terms slight, moderate, and severe.

Topsoil is used for topdressing an area where vegetation is to be established and maintained. Suitability is affected mainly by ease of working and spreading the soil material, as for preparing a seedbed; natural fertility of the material, or the response of plants when fertilizer is applied; and absence of substances toxic to plants. Texture of the soil material and its content of stone fragments are characteristics that affect suitability, but also considered in the ratings is damage that will result in the area from which topsoil is taken.

Road subgrade is soil material used in embankments for roads. The suitability ratings reflect (1) the predicted performance of soil after it has been placed in an embankment that has been properly compacted and provided with adequate drainage and (2) the relative ease of excavating the material in borrow areas.

Sand and gravel have not been located in Lipscomb County in significant amounts. Soft caliche underlies the Potter soils. Tivoli and Lincoln soils are sources of

TABLE 4.—*Estimated soil properties*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The the instructions for referring to other series that appear in

Soil series and map symbols	Hydrologic soil group	Depth from surface	Classification		
			USDA texture	Unified	AASHO
		In			
Acuff: AcB, AcC	B	0–5	Loam	CL, ML–CL	A–4, A–6
		5–40	Clay loam	CL	A–6
		40–85	Sandy clay loam	CL	A–6
Altus: AlA	B	0–8	Fine sandy loam	SM, ML	A–2, A–4
		8–35	Sandy clay loam	SC, CL	A–4, A–6
		35–68	Fine sandy loam	SM, ML	A–2, A–4
		68–80	Silty clay loam	CL, SC	A–6
		80–85	Fine sandy loam	SM, ML	A–2, A–4
*Berda: BdB, BeD	B	0–70	Loam	SC, CL	A–4, A–6
For properties of Potter soils in BeD, see Potter series.					
Bippus: BrA, BrB, BuB	B	0–66	Clay loam	SM–SC, SC, CL	A–4, A–6
Darrouzett: DaA, DaB, DaC	C	0–6	Silty clay loam	CL	A–6
		6–55	Silty clay loam	CL, CH	A–6, A–7–6
		55–75	Clay loam	CL	A–6
		75–100	Silty clay loam	CL	A–6
*Devol: DeD, DsC3	B	0–10	Loamy fine sand	SM	A–2–4, A–4
For properties of Springer soils in DsC3, see Springer series.		10–24	Fine sandy loam	SM, ML	A–4, A–2–4
		24–85	Loamy fine sand	SM	A–2–4, A–4
*Estacado: EsB, EtB	B	0–13	Silty clay loam	CL, ML	A–6
For properties of Olton soils in EtB, see Olton series.		13–23	Clay loam	CL, ML	A–6, A–7–6
		23–90	Clay loam	CL, ML	A–6, A–7–6
Grandfield: GrB, GrC	B	0–8	Fine sandy loam	SM–SC, SC	A–2, A–4
		8–46	Sandy clay loam	SC, CL	A–4, A–6
		46–72	Fine sandy loam	SM, SC, SM–SC	A–2, A–4
Guadalupe: Gu	B	0–45	Fine sandy loam, loamy fine sand, loam, clay loam.	SM, SM–SC	A–4, A–2–4
		45–66	Sand	SM	A–2–4
Likes: LkC	A	0–5	Loamy fine sand	SM–SC, SM	A–2–4
		5–60	Loamy sand	SM–SC, SM	A–2–4
Lincoln: Ln	A	0–6	Fine sandy loam	SM, SM–SC	A–4, A–2–4
		6–20	Loamy fine sand	SM	A–4
		20–35	Loamy sand	SM	A–4
		35–60	Sand	SM	A–2
Mansker: McB	B	0–8	Loam	CL, SC	A–4, A–6
		8–78	Clay loam	CL, SC, ML	A–6
		78–85	Sandy clay loam	CL	A–6
*Mobeetie: MrB, MrC, MrD, MxD	B	0–85	Fine sandy loam	ML–CL, SM–SC	A–4
For properties of Potter soils in MxD, see Potter series.					
Olton: OlB, OlC	C	0–10	Clay loam	CL	A–4, A–6
		10–36	Clay loam	CL	A–6, A–7–6
		36–90	Clay loam	CL, ML–CL	A–6, A–7–6
*Paloduro: PaA, PaB, PaC, PbD, PdC	B	0–14	Loam	SC, CL	A–4, A–6
For properties of Veal soils in PbD and PdC, see Veal series; for properties of Berda soils in PbD, see Berda series; for properties of Portales soils in PdC, see Portales series.		14–66	Clay loam	SC, CL	A–4, A–6
Portales: PoB	B	0–12	Clay loam	CL	A–4, A–6
		12–48	Clay loam	CL	A–4, A–6
		48–65	Loam	SC, CL	A–4, A–6
		65–90	Fine sandy loam	SM, ML	A–4

significant in engineering

soils in such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the first column of this table. The symbol < means less than]

Percentage passing sieve—				Permeability	Available water capacity	Reaction	Shrink-swell potential
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)				
				In per hr	*In per in of soil*	*pH*	
100	100	95–100	50–70	0.63–2.0	0.14–0.17	6.6–7.3	Low.
100	100	95–100	65–75	0.63–2.0	0.15–0.18	6.6–8.4	Low.
95–100	90–100	90–100	60–75	0.63–2.0	0.12–0.15	7.9–8.4	Low.
100	100	90–100	30–60	0.63–2.0	0.09–0.13	6.6–7.3	Low.
100	100	90–100	40–60	0.63–2.0	0.12–0.16	6.6–7.8	Low.
100	100	90–100	30–60	2.0–6.3	0.09–0.13	7.9–8.4	Low.
95–100	90–100	90–100	40–60	0.63–2.0	0.12–0.15	7.9–8.4	Low.
100	100	90–100	30–60	2.0–6.3	0.09–0.13	7.9–8.4	Low.
95–100	95–100	80–95	40–60	0.63–2.0	0.14–0.17	7.9–8.4	Low.
100	95–100	80–100	36–70	0.63–2.0	0.16–0.20	7.4–8.4	Low.
100	95–100	90–100	55–75	0.63–2.0	0.15–0.20	6.6–8.4	Moderate.
100	95–100	90–100	80–96	0.20–0.63	0.15–0.20	6.6–8.4	Moderate.
100	95–100	90–100	70–75	0.20–0.63	0.15–0.20	7.9–8.4	Moderate.
95–100	90–100	90–100	60–75	0.20–0.63	0.10–0.15	7.9–8.4	Moderate.
100	100	50–75	30–50	2.0–6.3	0.06–0.09	6.6–7.3	Very low.
100	100	75–85	30–60	2.0–6.3	0.09–0.13	6.6–7.3	Low.
100	100	60–75	30–50	2.0–6.3	0.06–0.09	7.4–8.4	Very low.
100	98–100	95–100	50–85	0.63–2.0	0.14–0.18	7.9–8.4	Low.
95–100	95–100	85–100	55–90	0.63–2.0	0.12–0.16	7.9–8.4	Low.
95–100	95–100	95–100	60–95	0.63–2.0	0.13–0.17	7.9–8.4	Low.
100	100	90–100	30–45	2.0–6.3	0.09–0.13	6.6–7.3	Low.
100	100	90–100	40–60	0.63–2.0	0.12–0.16	6.6–7.8	Low.
100	100	90–100	30–45	2.0–6.3	0.09–0.13	7.9–8.4	Low.
95–100	95–100	75–85	30–45	2.0–6.3	0.10–0.13	7.9–8.4	Low.
100	95–100	75–85	20–30	2.0–6.3	0.06–0.10	7.9–8.4	Low.
90–98	90–98	75–95	12–30	2.0–6.3	0.06–0.10	6.6–8.4	Very low.
95–98	95–97	75–95	12–30	2.0–6.3	0.04–0.08	7.9–8.4	Very low.
95–100	95–100	75–85	30–45	6.3–20.0	0.10–0.13	7.9–8.4	Low.
100	100	50–90	36–50	6.3–20.0	0.06–0.09	7.9–8.4	Very low.
100	100	50–90	36–50	6.3–20.0	0.06–0.09	7.9–8.4	Very low.
100	90–100	50–90	15–35	6.3–20.0	0.04–0.06	7.9–8.4	Very low.
95–100	95–100	80–95	40–60	0.63–2.0	0.14–0.18	7.9–8.4	Low.
90–100	90–100	85–95	40–80	0.63–2.0	0.12–0.16	7.9–8.4	Low.
98–100	95–100	90–98	60–75	0.63–2.0	0.14–0.18	7.9–8.4	Low.
95–98	90–95	85–95	40–65	2.0–6.3	0.10–0.13	7.9–8.4	Very low.
100	95–100	85–100	55–75	0.63–2.0	0.15–0.20	6.6–7.3	Low.
100	90–100	90–100	75–95	0.20–0.63	0.15–0.20	7.4–8.4	Moderate.
95–100	90–100	90–100	60–85	0.20–0.63	0.10–0.15	7.9–8.4	Moderate.
95–100	95–100	80–95	40–60	0.63–2.0	0.14–0.16	7.9–8.4	Low.
95–100	95–100	80–95	40–60	0.63–2.0	0.14–0.17	7.9–8.4	Low.
95–100	95–100	85–95	60–80	0.63–2.0	0.14–0.18	7.9–8.4	Low.
95–100	90–100	85–95	60–80	0.63–2.0	0.12–0.16	7.9–8.4	Low.
95–100	95–100	85–95	45–70	0.63–2.0	0.14–0.17	7.9–8.4	Low.
95–100	95–100	85–95	45–65	2.0–6.3	0.10–0.13	7.9–8.4	Low.

TABLE 4.—*Estimated soil properties*

Soil series and map symbols	Hydrologic soil group	Depth from surface	Classification		
			USDA texture	Unified	AASHO
		In			
Potter: PrD	C	0–10	Loam, gravelly loam	ML, CL	A–4, A–6
		10–48	Fractured, platy, and weakly cemented caliche and caliche earth of loam texture.	GM, GC, SM, SC	A–2, A–4, A–6
Pullman: PuA, PuB	D	0–8	Silty clay loam	CL	A–7–6
		8–55	Clay	CL, CH	A–7–6
		55–90	Clay loam	CL	A–7–6
Randall: Ra	D	0–80	Silty clay and clay	CH, CL, MH	A–7–6
Springer: SlB	B	0–11	Loamy fine sand	SM, SP–SM	A–3, A–2–4
		11–43	Fine sandy loam	SM, SM–SC	A–2–4
		43–74	Loamy fine sand	SP–SM, SM	A–2–4
		74–85	Fine sandy loam	SM, SM–SC	A–2–4
Spur: Sp	B	0–9	Silty clay loam	CL, ML–CL	A–6, A–7–6
		9–32	Clay loam	CL, ML–CL	A–6
		32–40	Sandy clay loam	CL, SC	A–6
		40–66	Loamy fine sand	SM	A–2–4
Sweetwater: Sw	D	0–17	Sandy clay loam	CL, SC	A–6
		17–60	Loamy fine sand	SM	A–2–4
Tipton: TpA, TpB	B	0–7	Loam	CL, ML	A–4
		7–92	Clay loam	CL, ML	A–6, A–4
Tivoli: Tv	A	0–66	Fine sand	SP–SM	A–2, A–3
Veal: VeB, VeC	B	0–9	Loam	SM–SC, CL	A–4, A–6
		9–28	Clay loam	CL, SC	A–6
		28–66	Loam	SM–SC, CL	A–4, A–6

poorly graded sand. Ratings for sand and gravel were omitted from the table.

Highway locations, as rated in table 5, are for highways that have an all-weather surface expected to carry automobile traffic all year. They have a subgrade of underlying soil material; a base of gravel, crushed rock, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly of asphalt or concrete. These roads are graded to shed water and have ordinary provisions for drainage. They are built mainly from soil at hand, and most cuts and fills are less than 6 feet deep.

Foundations for low buildings, as rated in table 5, are foundation footings placed in undisturbed soil to support buildings not more than three stories high. The features that affect the rating are those that relate to capacity to support load and resist settlement under load, and those that relate to ease of excavation. Soil properties that affect capacity to support load are wetness, susceptibility to flooding, density, plasticity, texture, and shrink-well potential. Those that affect excavation are wetness, slope, depth to bedrock, and content of stones and rocks.

Septic tank filter fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into natural soil. The soil material between depths of 18 inches and 6 feet is evaluated. The soil properties considered are those that affect both absorption of effluent and construction and operation of the system. Properties that affect absorption are permeability, depth to water table or rock, and susceptibility to flooding. Slope affects difficulty of layout and construction and also the risk of erosion, lateral seepage, and downslope flow of effluent. Large rocks or boulders increase construction costs.

Sewage lagoons are shallow ponds constructed to hold sewage 2 to 5 feet deep long enough for bacteria to decompose the solids. A lagoon has a nearly level floor and sides, or embankments, of compacted soil material. The assumption is made that the embankment is compacted to medium density and the pond is protected from flooding. Properties are considered that affect the pond floor and the embankment. Those that affect the pond floor are permeability, organic matter, slope and, if the floor needs to be leveled, depth.

Sanitary landfill is a method of disposing of refuse in dug trenches. The waste is spread in thin layers, compacted, and covered with soil throughout the disposal period. Landfill areas are subject to heavy vehicular traffic. Some soil properties that affect suitability for landfill are ease of excavation, hazard of polluting ground water, and trafficability. The best soils have moderately slow permeability, withstand heavy traffic, and are friable and easy to excavate. Unless otherwise stated, the ratings in table 5 apply only to a depth of about 6 feet, and therefore limitation ratings of *slight* or *moderate* may not be valid if trenches are to be much deeper than that. For some soils, reliable predictions can be made to a depth of 10 or 15 feet, but regardless of that, every site should be investigated before it is selected.

Pond reservoir areas hold water behind a dam or

significant in engineering—(Continued)

Percentage passing sieve—				Permeability	Available water capacity	Reaction	Shrink-swell potential
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)				
				In per hr	*In per in of soil*	*pH*	
80–95	70–90	60–85	50–70	0.63–2.0	0.12–0.16	7.9–8.4	Low.
30–80	25–75	20–60	12–50	0.63–2.0	0.01–0.04	7.9–8.4	Low.
100	100	95–100	70–90	0.20–0.63	0.14–0.18	6.6–7.3	Moderate.
100	100	95–100	80–95	<0.06	0.12–0.16	7.4–8.4	High.
95–100	90–100	90–100	80–95	0.06–0.20	0.12–0.16	7.9–8.4	Moderate.
100	100	96–100	60–98	<0.06	0.14–0.18	6.6–8.4	High.
100	95–100	70–85	8–25	6.3–20.0	0.06–0.10	6.6–7.3	Very low.
100	95–100	80–95	13–35	2.0–6.3	0.09–0.14	6.6–7.3	Low.
100	95–100	70–85	8–25	2.0–6.3	0.06–0.10	6.6–7.3	Very low.
100	95–100	80–95	13–35	2.0–6.3	0.09–0.14	6.6–7.3	Low.
100	100	95–100	75–95	0.63–2.0	0.15–0.20	7.9–8.4	Low.
100	100	95–100	70–90	0.63–2.0	0.15–0.20	7.9–8.4	Low.
100	95–100	80–95	40–70	0.63–2.0	0.16–0.20	7.9–8.4	Low.
100	85–95	50–75	15–30	6.3–20.0	0.06–0.09	7.9–8.4	Very low.
100	95–100	80–95	40–70	0.63–2.0	0.16–0.20	7.9–8.4	Moderate.
95–100	90–100	50–80	15–35	6.3–20.0	0.04–0.10	7.9–8.4	Very low.
100	100	95–100	55–70	0.63–2.0	0.14–0.16	6.6–7.3	Low.
100	100	95–100	75–85	0.63–2.0	0.15–0.19	6.6–8.4	Moderate.
100	100	85–95	9–20	6.3–20.0	0.04–0.06	6.6–8.4	Very low.
95–100	95–100	80–95	40–60	0.63–2.0	0.14–0.17	7.9–8.4	Low.
90–100	80–95	70–95	40–70	0.63–2.0	0.10–0.12	7.9–8.4	Low.
95–100	95–100	80–95	40–60	0.63–2.0	0.14–0.17	7.9–8.4	Low.

embankment. Soils suitable for pond reservoir areas have low seepage, which is related to their permeability and depth to fractured or permeable bedrock or other permeable material.

Pond embankments are raised structures of soil material constructed across drainageways in order to impound water. These embankments are generally less than 20 feet high, are constructed of "homogeneous" soil material, and compacted to medium density. Embankments having core-and-shell type construction are not rated in this table. Embankment foundation, reservoir area, and slope are assumed to be suitable for pond construction. Soil properties are considered that affect the embankment and the availability of borrow material. The best soils have good slope stability, low permeability, slight compressibility under load, and good resistance to piping and erosion. The best borrow material is free of stones or rocks and thick enough for easy excavation.

Camp areas are used intensively for tents and small camp trailers and the accompanying activities of outdoor living. Little preparation of the site is required, other than shaping and leveling for tent and parking areas. Camp areas are subject to heavy foot traffic and limited vehicular traffic. The best soils have mild slopes, good drainage, a surface free of rocks and coarse fragments, freedom from flooding during periods of heavy use, and a surface that is firm after rains but not dusty when dry.

Picnic areas are attractive natural or landscaped tracts used primarily for preparing meals and eating outdoors. These areas are subject to heavy foot traffic. Most of the vehicular traffic, however, is confined to access roads. The best soils are firm when wet but not dusty when dry; are free of flooding during the season of use; and do not have slopes or stoniness that greatly increase cost of leveling sites or of building access roads.

Playgrounds are areas used intensively for baseball, football, badminton, and similar organized games. Soils suitable for this use withstand intensive foot traffic. The best soils have a nearly level surface free of coarse fragments and rock outcrops, good drainage, freedom from flooding during periods of heavy use, and a surface that is firm after rains but not dusty when dry. If grading and leveling are required, depth to rock is important.

Paths and trails are used for local and cross-country travel by foot or horseback. Design and layout should require little or no cutting and filling. The best soils are at least moderately well drained, are firm when wet but not dusty when dry, are flooded not more than once during the season of use, have slopes of less than 15 percent, and have few or no rocks or stones on the surface.

Irrigation of a soil is affected by such features as slope; susceptibility to stream overflow, water erosion, or soil blowing; soil texture; content of stones; accumulations of salts and alkali; depth of root zone; rate of water intake at the surface; permeability of soil layers below the surface layer and in fragipans or other layers that restrict movement of water; amount of water held

TABLE 5.—*Engineering*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The the instructions for referring to other series

Soil series and map symbols	Suitability as source of—		Degree of limitations and soil features affecting—					
	Topsoil	Road subgrade	Highway location	Foundations for low buildings	Septic tank filter fields	Sewage lagoons	Sanitary landfill [1]	Farm ponds: Reservoir areas
Acuff: AcB, AcC	Fair: 5 to 14 inches of loam.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight	Slight	Moderate: moderate permeability.	Moderate: moderate permeability.	Moderate: moderate permeability.
Altus: AlA	Fair: 6 to 8 inches of fine sandy loam.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight	Slight	Moderate: moderate permeability.	Slight	Moderate: moderate permeability.
*Berda: BdB	Good	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight	Slight	Moderate: slope; moderate permeability.	Slight	Moderate: moderate permeability.
BeD For Potter part of BeD, see Potter series.	Fair: slope.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: moderate permeability.
Bippus: BrA, BrB	Fair: clay loam texture.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight	Slight	Moderate: moderate permeability.	Moderate: clay loam texture.	Moderate: moderate permeability.
BuB	Good	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight	Slight	Moderate: moderate permeability.	Moderate: clay loam texture.	Moderate: moderate permeability.
Darrouzett: DaA	Fair: silty clay loam texture.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Moderate: moderate shrink-swell potential.	Moderate: moderately slow permeability.	Slight	Moderate: silty clay loam texture.	Moderate: moderately slow permeability.
DaB, DaC	Fair: silty clay loam texture.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Moderate: moderate shrink-swell potential.	Moderate: moderately slow permeability.	Moderate: slope.	Moderate: silty clay loam texture.	Moderate: moderately slow permeability.
*Devol: Ded, DsC3 For Springer part of DsC3, see Springer series.	Poor: loamy fine sand texture.	Good	Slight	Slight	Slight	Severe: moderately rapid permeability.	Severe: moderately rapid permeability.	Severe: moderately rapid permeability.
*Estacado: EsB, EtB. For Olton part of EtB, see Olton series.	Fair: silty clay loam texture.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight	Slight	Moderate: moderate permeability.	Moderate: clay loam texture.	Moderate: moderate permeability.
Grandfield: GrB	Fair: 5 to 16 inches fine sandy loam.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight	Slight	Moderate: moderate permeability.	Slight	Moderate: moderate permeability.

interpretations

soils in such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully that appear in the first column of this table.]

Degree of limitations and soil features affecting—Continued					Soil features affecting—			
Farm Ponds—Continued	Recreation							Corrosivity of uncoated steel and contributing soil features
Embankments	Camp areas	Picnic areas	Playgrounds	Paths and trails	Irrigation	Terraces and diversions	Waterways	
Moderate: fair resistance to piping and erosion.	Slight	Slight	Moderate: slope:	Slight	Slope	All features favorable.	All features favorable.	Moderate: clay loam texture.
Slight	Slight	Slight	Slight	Slight	All features favorable.	All features favorable.	All features favorable.	Low.
Moderate: fair resistance to piping and erosion.	Slight	Slight	Moderate: slope.	Slight	Slope	All features favorable.	All features favorable.	Moderate: conductivity.
Moderate: fair resistance to piping and erosion.	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Slope	All features favorable.	All features favorable.	Moderate: conductivity.
Moderate: fair resistance to piping and erosion.	Moderate: clay loam texture.	Moderate: clay loam texture.	Moderate: clay loam texture.	Moderate: clay loam texture.	Slope	All features favorable.	All features favorable.	Moderate: clay loam texture.
Moderate: fair resistance to piping and erosion.	Slight	Slight	Slight	Slight	Slope	All features favorable.	All features favorable.	Moderate: clay loam texture.
Moderate: fair resistance to piping and erosion.	Moderate: moderately slow permeability; silty clay loam texture.	Moderate: silty clay loam texture.	Moderate: moderately slow permeability; silty clay loam texture.	Moderate: silty clay loam texture.	Slow intake rate.	All features favorable.	All features favorable.	Moderate: silty clay loam texture.
Moderate: fair resistance to piping and erosion.	Moderate: moderately slow permeability; silty clay loam texture.	Moderate: silty clay loam texture.	Moderate: moderately slow permeability; silty clay loam texture.	Moderate: silty clay loam texture.	Slow intake rate; slope.	All features favorable.	All features favorable.	Moderate: silty clay loam texture.
Moderate: poor resistance to piping and erosion.	Moderate: loamy fine sand texture.	Moderate: loamy fine sand texture.	Moderate: loamy fine sand texture; slope.	Moderate: loamy fine sand texture.	Fast intake rate; slope.	Soil blowing hazard.	Soil blowing hazard.	Low.
Moderate: fair stability and resistance to piping and erosion.	Moderate: clay loam texture.	Moderate: clay loam texture.	Moderate: clay loam texture.	Moderate: clay loam texture.	Slope	All features favorable.	All features favorable.	Moderate: clay loam texture.
Moderate: fair resistance to piping and erosion.	Slight	Slight	Slight	Slight	Fast intake rate.	Soil blowing hazard.	Soil blowing hazard.	Moderate: sandy clay loam texture.

TABLE 5.—*Engineering*

Soil series and map symbols	Suitability as source of—		Degree of limitations and soil features affecting—					
	Topsoil	Road subgrade	Highway location	Foundations for low buildings	Septic tank filter fields	Sewage lagoons	Sanitary landfill [1]	Farm ponds: Reservoir areas
GrC	Fair: 5 to 16 inches fine sandy loam.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight	Slight	Moderate: moderate permeability.	Slight	Moderate: moderate permeability.
Guadalupe: Gu	Good	Good	Moderate: flood hazard.	Severe: flood hazard.	Moderate: flood hazard.	Severe: moderately rapid permeability.	Severe: flood hazard.	Severe: moderately rapid permeability.
Likes: LkC	Poor: loamy fine sand texture.	Good	Slight	Slight	Slight	Severe: moderately rapid permeability.	Severe: moderately rapid permeability.	Severe: moderately rapid permeability.
Lincoln: Ln	Poor: 6 to 10 inches fine sandy loam.	Good	Severe: flood hazard.	Severe: flood hazard.	Severe: flood hazard.	Severe: rapid permeability.	Severe: flood hazard.	Severe: rapid permeability.
Mansker: McB	Fair: 8 to 10 inches of loam.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight	Slight	Moderate: moderate permeability.	Moderate: clay loam texture.	Moderate: moderate permeability.
*Mobeetie: Mrb, MrC, MrD	Good	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight	Slight	Severe: moderately rapid permeability.	Severe: moderately rapid permeability.	Severe: moderately rapid permeability.
MxD. For Potter part of MxD, see Potter series.	Good	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Moderate: slope.	Moderate: slope.	Severe: moderately rapid permeability.	Severe: moderately rapid permeability.	Severe: moderately rapid permeability.
Olton: OlB, OlC	Fair: clay loam texture.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Moderate: moderate shrink-swell potential.	Moderate: moderately slow permeability.	Slight where slopes are 1 to 2 percent; moderate where slopes are 2 to 5 percent.	Moderate: clay loam texture.	Moderate: moderately slow permeability.
*Paloduro: PaA, PaB, PaC, PdC	Fair: 10 to 20 inches of loam.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight	Slight	Moderate: moderate permeability.	Moderate: clay loam texture.	Moderate: moderate permeability.
PbD. For Veal part of PbD and PdC, see Veal series; for Berda part of PbD, see Berda series; for Portales part of PdC, see Portales series.	Fair: 10 to 20 inches of loam.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Moderate: slope.	Moderate: slope.	Moderate: moderate permeability.	Moderate: clay loam texture.	Moderate: moderate permeability.

interpretations—(Continued)

Degree of limitations and soil features affecting—Continued					Soil features affecting—			
Farm ponds—Continued	Recreation							Corrosivity of uncoated steel and contributing soil features
Embankments	Camp areas	Picnic areas	Playgrounds	Paths and trails	Irrigation	Terraces and diversions	Waterways	
Moderate: fair resistance to piping and erosion.	Slight	Slight	Moderate: slope.	Slight	Fast intake rate.	Soil blowing hazard.	Soil blowing hazard.	Moderate: sandy clay loam texture.
Moderate: fair resistance to piping and erosion.	Severe: flood hazard.	Moderate: flood hazard.	Moderate: flood hazard.	Slight	Flood hazard.	Flood hazard.	Flood hazard.	Low.
Moderate: poor resistance to piping and erosion.	Moderate: loamy fine sand texture.	Moderate: loamy fine sand texture.	Moderate: loamy fine sand texture.	Moderate: loamy fine sand texture.	Fast intake rate; erodible.	Soil blowing hazard.	Soil blowing hazard.	Low.
Moderate: poor resistance to piping and erosion.	Severe: flood hazard.	Severe: flood hazard.	Severe: flood hazard.	Moderate: flood hazard.	Fast intake rate; soil blowing hazard.	Soil blowing hazard.	Soil blowing hazard.	Very low.
Moderate: fair resistance to piping and erosion.	Slight	Slight	Moderate: slope.	Slight	Slope	All features favorable.	All features favorable.	Moderate: clay loam texture.
Moderate: fair resistance to piping and erosion.	Slight	Slight	Moderate: slope.	Slight	Slope	Slope	Slope	Low.
Moderate: fair resistance to piping and erosion.	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Slope	Slope	Slope	Low.
Moderate: fair resistance to piping and erosion.	Moderate: clay loam texture.	Moderate: clay loam texture.	Moderate: clay loam texture.	Moderate: clay loam texture.	Slow intake rate.	All features favorable.	All features favorable.	Moderate: clay loam texture.
Moderate: fair resistance to piping and erosion.	Slight	Slight	Moderate: slope:	Slight	Slope	All features favorable.	All features favorable.	Moderate: clay loam texture.
Moderate: fair resistance to piping and erosion.	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Slope	All features favorable.	All features favorable.	Moderate: clay loam texture.

TABLE 5.—*Engineering*

Soil series and map symbols	Suitability as source of—		Degree of limitations and soil features affecting—					
	Topsoil	Road subgrade	Highway location	Foundations for low buildings	Septic tank filter fields	Sewage lagoons	Sanitary landfill [1]	Farm ponds: Reservoir areas
Portales: PoB	Fair: clay loam texture.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity; slope.	Slight	Slight	Moderate: moderate permeability.	Moderate: clay loam texture.	Moderate: moderate permeability.
Potter: PrD	Poor: 15 to 35 percent coarse fragments.	Fair: fair traffic-supporting capacity.	Moderate: slopes of 5 to 16 percent; fair traffic-supporting capacity.	Moderate: slope.	Moderate: slope.	Severe: seepage.	Severe: 4 to 12 inches to fractured caliche; rippable rock below a depth of 10 inches.	Severe: seepage.
Pullman: PuA, PuB.	Fair: silty clay loam texture.	Poor: high shrink-swell potential.	Severe: high shrink-swell potential.	Severe: high shrink-swell potential.	Severe: very slow permeability.	Slight	Severe: clay texture.	Slight
Randall: Ra	Poor: silty clay and clay textures.	Poor: high shrink-swell potential.	Severe: flood hazard; high shrink-swell potential.	Severe: flood hazard; high shrink-swell potential.	Severe: very slow permeability.	Slight	Severe: flood hazard; clay texture.	Slight
Springer: SlB	Poor: loamy fine sand texture.	Good	Slight	Slight	Slight	Severe: moderately rapid permeability.	Severe: moderately rapid permeability.	Severe: moderately rapid permeability.
Spur: Sp	Fair: silty clay loam texture.	Fair: fair traffic-supporting capacity.	Moderate: flood hazard; fair traffic-supporting capacity.	Severe: flood hazard.	Moderate: flood hazard.	Moderate: moderate permeability.	Severe: flood hazard.	Moderate: moderate permeability.
Sweetwater: Sw	Poor: wetness makes excavation difficult.	Poor: poorly drained.	Severe: poorly drained.	Severe: poorly drained; flood hazard.	Severe: poorly drained; flood hazard.	Severe: high water table; flood hazard.	Severe: high water table; flood hazard.	Severe: moderately rapid permeability and seepage at a depth below 17 inches.
Tipton: TpA	Fair: 6 to 12 inches of loam.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity; moderate shrink-swell potential.	Moderate: moderate shrink-swell potential.	Slight	Moderate: moderate permeability.	Moderate: clay loam texture.	Moderate: moderate permeability.

interpretations—(Continued)

Degree of limitations and soil features affecting—Continued					Soil features affecting—			
Farm ponds—Continued	Recreation							Corrosivity of uncoated steel and contributing soil features
Embankments	Camp areas	Picnic areas	Playgrounds	Paths and trails	Irrigation	Terraces and diversions	Waterways	
Moderate: fair resistance to piping and erosion.	Moderate: clay loam texture.	Moderate: clay loam texture.	Moderate: clay loam texture.	Moderate: clay loam texture.	Slope	All features favorable.	All features favorable.	Moderate: clay loam texture.
Severe: 4 to 12 inches of suitable material.	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Slope: 4 to 12 inches to fractured caliche.	Slope: 4 to 12 inches to fractured caliche.	Slope: 4 to 12 inches to fractured caliche.	Moderate: conductivity.
Moderate: fair resistance to piping and erosion.	Moderate: very slow permeability; silty clay loam texture.	Moderate: silty clay loam texture.	Moderate: silty clay loam texture; very slow permeability.	Moderate: silty clay loam texture.	Slow intake rate.	All features favorable.	All features favorable.	High: clay texture.
Moderate: fair resistance to piping and erosion.	Severe: flood hazard; somewhat poorly drained.	Severe: flood hazard.	Severe: somewhat poorly drained; flood hazard.	Severe: flood hazard.	Slow intake rate; flood hazard.	Flood hazard.	Flood hazard.	Very high: clay texture; somewhat poorly drained.
Moderate: fair resistance to piping and erosion.	Moderate: loamy fine sand texture.	Moderate: loamy fine sand texture.	Moderate: slope; loamy fine sand.	Moderate: loamy fine sand texture.	High intake rate.	Soil blowing hazard.	Soil blowing hazard.	Low.
Moderate: fair resistance to piping and erosion.	Severe: flood hazard.	Moderate: flood hazard; silty clay loam texture.	Severe: flood hazard.	Moderate: flood hazard; silty clay loam texture.	Flood hazard.	Flood hazard.	Flood hazard.	Moderate: clay loam texture.
Moderate: fair resistance to piping and erosion.	Severe: high flood hazard; poorly drained.	Severe: high flood hazard; poorly drained.	Severe: high flood hazard; poorly drained.	Severe: poorly drained.	Poorly drained; flood hazard.	Poorly drained; flood hazard.	Poorly drained; flood hazard.	High: sandy clay loam texture; high water table.
Moderate: fair resistance to piping and erosion.	Slight	Slight	Slight	Slight	All features favorable.	All features favorable.	All features favorable.	Moderate: clay loam texture.

TABLE 5.—*Engineering*

Soil series and map symbols	Suitability as source of—		Degree of limitations and soil features affecting—					
	Topsoil	Road subgrade	Highway location	Foundations for low buildings	Septic tank filter fields	Sewage lagoons	Sanitary landfill [1]	Farm ponds: Reservoir areas
TpB	Fair: 6 to 12 inches of loam.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity; moderate shrink-swell potential.	Moderate: moderate shrink-swell potential.	Slight	Moderate: moderate permeability.	Moderate: clay loam texture.	Moderate: moderate permeability.
Tivoli: Tv	Poor: fine sand texture.	Good	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: rapid permeability.	Severe: fine sand texture; rapid permeability.	Severe: rapid permeability.
Veal: VeB, VeC	Poor: 6 to 9 inches of loam.	Fair: fair traffic-supporting capacity;	Moderate: fair traffic-supporting capacity.	Slight	Slight	Severe: seepage.	Slight	Severe: seepage.

[1] Onsite studies of the underlying strata, water table, and hazards of aquifer pollution and drainage into ground water should be

TABLE 6.—*Engineering*

[Tests performed by the Texas Highway Department in accordance with standard

Soil name and location	Parent material	Texas report No.	Depth	Shrinkage		Mechanical analysis [1]	
				Limit	Ratio	Percentage passing sieve— ⅜ in	Percentage passing sieve— No. 4 (4.7 mm)
			In	*Pct*			
Darrouzett silty clay loam: 0.5 mile W. of Darrouzett blinker light on Texas Highway No. 15, then 40 feet S. of highway right-of-way. (Modal)	Moderately fine textured calcareous sediment of the High Plains.	69–509–R	10–20	14	1.93		
		69–510–R	35–55	16	1.95		
Olton clay loam: 150 feet N. and 35 feet E. of the SW. corner of section 324, block 43 of HTC RR Co. Survey; about 4 miles N. of the junction of U.S. Highway No. 83 and Texas Highway No. 23. (Modal)	Moderately fine textured calcareous sediment of the High Plains.	69–511–R	10–24	16	1.93		
		69–512–R	45–60	14	1.97	100	99

[1] Mechanical analyses according to the AASHO Designation T 88–57 (see footnote 7, page 46). Results by this procedure may differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in this table are not suitable for naming textural classes for soil.

interpretations—(Continued)

Degree of limitations and soil features affecting—Continued					Soil features affecting—			Corrosivity of uncoated steel and contributing soil features
Farm ponds—Continued	Recreation							
Embankments	Camp areas	Picnic areas	Playgrounds	Paths and trails	Irrigation	Terraces and diversions	Waterways	
Moderate: fair resistance to piping and erosion.	Slight	Slight	Moderate: slope.	Slight	Slope	All features favorable.	All features favorable.	Moderate: clay loam texture.
Severe: poor slope stability.	Severe: fine sand texture.	Severe: fine sand texture.	Severe: fine sand texture.	Severe: fine sand texture.	High intake rate; slope.	Soil blowing hazard; slope.	Soil blowing hazard; slope.	Very low.
Moderate: fair resistance to piping and erosion.	Slight	Slight	Moderate: slope.	Slight	Slope	All features favorable.	All features favorable.	High: clay loam texture.

made for landfill deeper than 5 or 6 feet.

test data

procedures of the American Association of State Highway Officials (AASHO)]

Mechanical analysis [1]—Continued						Liquid limit	Plasticity index	Classification	
Percentage passing sieve—Continued			Percentage smaller than—						
No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)	0.05 mm	0.005 mm	0.002 mm			AASHO [2]	Unified [3]
						Pct			
	100	96	88	45	39	50	30	A–7–6(18)	CL, CH
100	99	89	77	38	33	40	22	A–6(13)	CL
	100	92	83	41	35	46	26	A–7–6(15)	CL
98	94	83	76	48	38	43	27	A–7–6(15)	CL

[2] Based on AASHO Designation M 145–49. (See footnote 7, page 46).
[3] Based on the Unified soil classification system. (See footnote 6, page 46).

available to plants; and need for drainage, or depth to water table or bedrock.

Terraces and diversions are embankments, or ridges, constructed across the slope to intercept runoff so that it soaks into the soil or flows slowly to a prepared outlet. Features that affect suitability of a soil for terraces are uniformity and steepness of slope; depth to bedrock or other unfavorable material; presence of stones; permeability; and resistance to water erosion, soil slipping, and soil blowing. A soil suitable for these structures provides outlets for runoff and is not difficult to vegetate.

Waterways are either natural or shaped channels seeded with grass to carry runoff water without causing erosion. The suitability of a soil for grassed waterways is determined by the erosion hazard; the amount of shaping that can be done, which in turn depends on slope, stoniness, and depth to bedrock; and the difficulty in establishing vegetation.

Corrosivity, as used in table 5, pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel. The rate of corrosion of uncoated steel is related to soil properties such as drainage, texture, total acidity, and electrical conductivity of the soil material. Installations of uncoated steel that intersect soil boundaries or soil horizons are more susceptible to corrosion than installations entirely in one kind of soil or in one soil horizon. A corrosivity rating of *low* means that there is a low probability of soil-induced corrosion damage. A rating of *high* means that there is a high probability of damage, so that protective measures for steel should be used to avoid or minimize damage.

Engineering test data

Table 6 contains engineering test data for some of the soils in Lipscomb County. These tests were made to help evaluate the soils for engineering purposes. The engineering classifications given are based on data obtained by mechanical analyses and by tests to determine liquid limits and plastic limits.

The mechanical analyses were made by combined sieve and hydrometer methods.

Shrinkage limit is the percentage of moisture at which shrinkage of the soil material stops.

Shrinkage ratio is the relation of change in volume of the soil material to the water content of the soil material when at the shrinkage limit. The change in volume is expressed as a percentage of the air-dry volume of the soil material, and the water content is expressed as a percentage of the weight of the soil material when ovendry.

Liquid limit and plasticity index indicate the effect of water on the strength and consistence of soil material. As the moisture content of a clayey soil is increased from a dry state, the material changes from a semisolid to a plastic state. If the moisture content is further increased, the material changes from a plastic to a liquid state. The plastic limit is the moisture content at which the soil material changes from the semisolid to plastic state; and the liquid limit, from a plastic to a liquid state. The plasticity index is the numerical difference between the liquid limit and the plastic limit.

Formation and Classification of the Soils

This section discusses the factors of soil formation, the processes of horizon differentiation, and the classification of the soils. A table shows the classification of the soil series by higher categories.

Formation of the Soils

The five major factors of soil formation are climate, living organisms (especially vegetation), parent material, relief, and time. The relative importance of each factor differs from place to place, and each modifies the effect of the other four. In some cases one factor may dominate in the formation of a soil. Therefore, the kind of soil that forms in one area differs from the kind of soil that forms in another if there is a difference in one or more of these major factors.

Climate

Lipscomb County has a generally uniform, dry, steppe climate that is characterized by mild winters. Soil formation is slow because of long, dry periods and little rainfall. The soils are seldom wet below the root zone, and as a result many of them have a horizon in which calcium carbonate has accumulated. Leaching has not removed free lime from the upper layers of Mansker, Veal, and Mobeetie soils. The effects of climate on soil formation are modified locally by relief and runoff.

Living organisms

Plants, micro-organisms, and earthworms and other animals are important in the formation of soil. The kinds and amounts of plants are determined partly by the climate and partly by the soils. The vegetation in this county is mostly grass, but there are some brushy plants and trees. The grasses are tall or short. Tivoli and Devol soils, which are sandy, support tall grasses; Darrouzett soils, which have higher clay content, support short grasses.

Prairie vegetation contributes a large amount of organic matter to the soil. Grass leaves and stems fall on the surface, decay, and darken the surface layer. Roots decompose and distribute organic matter throughout the surface layer and subsoil and provide food for earthworms and micro-organisms.

Worm casts constitute a large part of the surface layer of some soils. Prairie dogs and other rodents offset the leaching of soluble minerals and destroy soil structure.

Man also has influenced soil formation by fencing range and allowing it to be overgrazed, by changing the vegetation, and by clearing and plowing the soils for crops. Man has clean harvested the crops and not controlled runoff and soil blowing. Because of these practices, organic matter has been depleted and silt and clay particles have been blown from the plow layer. Heavy machinery and untimely tillage have compacted the soils and have slowed the infiltration of water and air. Irrigation has drastically changed the natural moisture regime in some areas.

Parent material

Parent material is the unconsolidated mass from which soil forms. It determines the chemical and mineralogical composition of the soil. The origin of the parent material of the soils of Lipscomb County is mixed.

The soils of the Rolling Plains developed from three different kinds of parent material; old alluvial outwash, recent deposits of alluvium, and wind-laid material. The soils of the High Plains and soils associated with the High Plains formed in calcareous, loamy, wind-laid material.

Grandfield and Acuff soils are among those that formed in a fairly thick mantle of old alluvial outwash. These soils cover large areas throughout the county. Spur, Lincoln, and Guadalupe soils, which are on the flood plains of the major creeks, are examples of soils that formed in recent deposits of sandy and loamy alluvium.

Relief

Relief influences soil formation through its effects on drainage and runoff. If other factors of soil development are equal, the degree of profile development depends on the amount of water that enters a soil. For example, soils of the Mobeetie and Berda series, which are on uplands, commonly have stronger slopes and absorb less moisture and normally have a less well-developed profile than Darrouzett soils, which are on flats on uplands. In addition, the formation of steep soils is retarded by continuous erosion.

Relief also affects the kind and amount of vegetation on a soil. Soils that have north-facing slopes receive less sunlight than those that have south-facing slopes and consequently lose less moisture through evaporation. As a result, soils that have north-facing slopes have a denser plant cover and generally are more strongly developed. Similarly, soils that have east-facing slopes are more developed than those that have west-facing slopes.

Time

The characteristics of a soil mainly are determined by the length of time that the soil-forming factors have been active. A long time generally is required for the formation of horizons that are well defined and genetically related. For example, soils of the Grandfield and Pullman series, in which soil-forming factors have been active for a long time, have approached equilibrium with their environment. They are mature, or old, soils and show marked horizon differentiation. Examples of young soils that have a weakly developed profile are Guadalupe soils on bottom lands and Mobeetie soils on foot slopes below the caprock escarpment.

Processes of Horizon Differentiation

The three processes involved in the formation of soil horizons in Lipscomb County are (1) accumulation of organic matter, (2) leaching of calcium carbonate and bases, and (3) formation and translocation of silicate clay minerals. More than one of these processes has been active in most soils.

The accumulation of organic matter in the upper part of the profile has been important in the formation of an A1 horizon. The soils of Lipscomb County are generally low in organic matter because it decomposes rapidly.

Nearly all of the soils in this county have been leached, to some degree, of free carbonates and bases. The leaching of carbonates has contributed to the development of horizons. For example, Grandfield soils have been leached of most carbonates and show distinct horizons. In contrast, Mobeetie soils have not been leached of free carbonates and do not show distinct horizons. There is some agreement among soil scientists that the removal of some bases precedes the translocation of silicate clay minerals.

This translocation of clay minerals has also contributed to the formation of horizons in the soils. The eluviated A horizon of some soils has less clay than the B horizon, and the B horizon commonly has an accumulation of clay in pores and on ped surfaces. Olton soils are examples of soils in which silicate clays have accumulated in the B horizon. In the soils of this county, leaching of carbonates and soluble salts and translocation of silicate clays are among the more important processes in horizon differentiation.

Classification of the Soils

Soils are classified so that we can more easily remember their significant characteristics, assemble knowledge about them, see their relationship to one another and to the whole environment, and understand their behavior and their response to manipulation. First through classification, and then through the use of soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

The system of classification used was adopted by the National Cooperative Soil Survey in March 1967. The system has six categories. Beginning with the most inclusive, the categories are the order, the suborder, the great group, the subgroup, the family, and the series. Table 7 shows the classification of the soil series in this county by family, subgroup, and order. The placement of some soil series in the system, particularly in families, may change as more precise information becomes available. Readers interested in the development of the system should refer to the latest literature available.[8] [9]

General Nature of the County

In this section the history, climate, and farming in the county are discussed.

History

Lipscomb County was created from the Bexar District in 1876. The county was officially organized in

[8] SIMONSON, ROY W. SOIL CLASSIFICATION IN THE UNITED STATES. Science, 137: 1027–1034, 1962.

[9] UNITED STATES DEPARTMENT OF AGRICULTURE. SOIL CLASSIFICATION, A COMPREHENSIVE SYSTEM, 7TH APPROXIMATION. 56 pp., illus. 1960. [Supplements issued in March 1967 and September 1968]

TABLE 7.—*Classification of soil series*

[Soil classification as of January 1971]

Series	Family	Subgroup	Order
Acuff	Fine-loamy, mixed, thermic	Aridic Paleustolls	Mollisols.
Altus	Fine-loamy, mixed, thermic	Pachic Argiustolls	Mollisols.
Berda	Fine-loamy, mixed, thermic	Typic Ustochrepts	Inceptisols.
Bippus	Fine-loamy, mixed, thermic	Cumulic Haplustolls	Mollisols.
Darrouzett	Fine, mixed, thermic	Pachic Paleustolls	Mollisols.
Devol	Coarse-loamy, mixed, thermic	Udic Haplustalfs	Alfisols.
Estacado	Fine-loamy, mixed, thermic	Calciorthidic Paleustolls	Mollisols.
Grandfield [1]	Fine-loamy, mixed, thermic	Udic Haplustalfs	Alfisols.
Guadalupe	Coarse-loamy, mixed, thermic	Fluventic Ustochrepts	Inceptisols.
Likes	Mixed, thermic	Typic Ustipsamments	Entisols.
Lincoln	Sandy, mixed, thermic	Typic Ustifluvents	Entisols.
Mansker	Fine-loamy, mixed, thermic	Aridic Calciustolls	Mollisols.
Mobeetie [2]	Coarse-loamy, mixed, thermic	Typic Ustochrepts	Inceptisols.
Olton	Fine, mixed, thermic	Aridic Paleustolls	Mollisols.
Paloduro	Fine-loamy, mixed, thermic	Aridic Haplustolls	Mollisols.
Portales	Fine-loamy, mixed, thermic	Aridic Calciustolls	Mollisols.
Potter	Loamy, carbonatic, thermic, shallow	Ustollic Calciorthids	Aridisols.
Pullman	Fine, mixed, thermic	Pachic Paleustolls	Mollisols.
Randall	Fine, montmorillonitic, thermic	Udic Pellusterts	Vertisols.
Springer	Coarse-loamy, mixed, thermic	Udic Paleustalfs	Alfisols.
Spur	Fine-loamy, mixed, thermic	Fluventic Haplustolls	Mollisols.
Sweetwater	Fine-loamy over sandy or sandy-skeletal, mixed (calcareous), thermic.	Fluvaquentic Haplaquolls	Mollisols.
Tipton [3]	Fine-loamy, mixed, thermic	Pachic Argiustolls	Mollisols.
Tivoli	Mixed, thermic	Typic Ustipsamments	Entisols.
Veal	Fine-loamy, mixed, thermic	Typic Ustochrepts	Inceptisols.

[1] These Grandfield soils are taxadjuncts to the Grandfield series because the hue of their B horizon is 7.5YR. The hue of the B horizon for the normal Grandfield soils is 5YR or redder. This difference does not affect the use, management, and behavior of these soils.

[2] In some places, the Mobeetie soil in mapping unit MrD is outside the range defined for the Mobeetie series because the depth to free carbonates in this soil is about 28 inches. Carbonates in the normal Mobeetie soils are above a depth of 15 inches. This difference does not affect use, management, and behavior of these soils.

[3] These Tipton soils are taxadjuncts to the Tipton series because they have a hue of 10YR in their B horizon. The hue of the B horizon for the normal Tipton soils ranges from 5YR to 7.5YR. This difference does not affect use, management, and behavior of these soils.

1887. Lipscomb has always been the county seat. The county and town are named after Abner Smith Lipscomb,who was Secretary of State of the Republic of Texas and later was Associate Justice of the Texas Supreme Court.

The first settlers came to the county in the 1880's and established large cattle ranches. After 1900, large areas of the native prairie sod were plowed up and farming was begun.

The population of the county has declined during the last 30 years. In 1940 the population was 3,764, in 1950 it was 3,658, in 1960 it was 3,406, and in 1970 it was 2,968.

There are elementary and high schools at Booker, Darrouzett, Follett, and Higgins and an elementary school in Lipscomb. Most parts of the county have electricity, natural gas, and telephones.

Climate[10]

Lipscomb County has a cool, dry, steppe climate that is characterized by mild winters.

The average annual precipitation is 21.57 inches, and in most years 85 percent of this amount falls from April through October. Monthly and annual precipitation are extremely variable. Since 1935, the highest total annual precipitation was 32.21 inches in 1941 at Follett. The lowest total annual precipitation was 10.48 inches in 1956. Warm-season rainfall is most commonly from thunderstorms. In an average year, thunderstorms occur on 51 days at Follett. In exceptionally wet years, a significant part of the total precipitation may come from intense downpours that run off rapidly.

The prevailing winds are southerly throughout the year, except during February and March, when northerly winds predominate. The average relative humidity at noon is estimated at 54 percent in January, 43 percent in April, 45 percent in July, and 44 percent in October. These values are representative of the four seasons. In an average year free-water evaporation exceeds precipitation by 44 inches. In winter Follett receives approximately 66 percent of the total possible sunshine. This amount is 67 percent in spring, 76 percent in summer, and 73 percent in fall.

In winter the cold, polar, Canadian airmasses that sweep southward across the Great Plains bring sharp drops in temperature to the area. Sometimes these airmass changes are accompanied by strong, northerly winds. At other times these changes slip in gradually from the northeast. However, cold spells rarely last longer than 48 hours before sunshine and southerly to southwesterly winds bring rapid warming. Nights are usually clear and cold, and freezes occur almost every night. Most days are sunny and mild. The lowest temperature at Follett since 1935 was —12° on January 4, 1959, and on February 1, 1951. Winter is a dry

[10] By ROBERT B. ORTON, climatologist for Texas, National Weather Service, U.S. Department of Commerce.

season. Precipitation is most commonly in the form of light snow that drifts. As a result of the drifting, the snow melt is not uniformly disturbed.

Spring has the greatest variety in weather. Warm and cold periods follow each other in rapid succession throughout March and April. March and April are also the windiest months. Occasionally, persistently strong northwesterly to southerly winds may blow dust in the area. Thunderstorms, which rarely occur in winter, increase in number through spring. They reach a peak of activity in May, June, and July, which in an average year are the wettest months.

Summer is the wettest season because of the frequent thundershowers. It is also one of the most pleasant seasons. Although afternoons are sometimes hot, most nights are pleasantly cool. Evaporative-type air conditioners operate efficiently in this relatively dry climate. The highest temperature at Follett, since 1935, was 110° on August 11, 1964, and on June 16, 1953.

Fall, like summer, is very pleasant. Although the weather has greater variability in fall than in summer, temperatures are moderate. Rain decreases in the fall. Mild, sunny days and clear, cool nights characterize this season. Winds are not so strong as in spring.

The warm season, or frost-free period, at Follett averages 202 days. The average dates of the last occurrence of 32° or below in spring and the first occurrence of 32° or below in fall are April 10 and October 29, respectively. Additional climatological information is given in table 8.

Farming

The major enterprises in Lipscomb County are dryland and irrigated farming and cattle ranching. About 71 percent of the county is used for range. The rest is used for crops. About 10,882 acres is irrigated.

Grain sorghum and wheat are the major cash grain crops. Some corn, mostly irrigated, is grown and used for grain or for silage. Forage sorghum is grazed out or is harvested for hay or for silage. Winter wheat is grown for grain on most farms, but much of the acreage is also used as winter pasture for cattle. Alfalfa, mostly irrigated, is grown for hay and pasture. Barley, oats, rye, and millet for hay are also grown on small acreages.

Irrigation farming started in the 1950's, and it has rapidly increased in use in the last decade. Most of the water for irrigation comes from wells. The approximate yield of irrigation wells ranges from 50 to 1,500 gallons per minute. Underground water in sufficient quantities for irrigation is not available in all parts of the county. The water available for irrigation is of good quality. The supply of underground water has a limited recharge potential, and the water table has dropped slightly in areas from which large quantities have been drawn. Soils that are moderately slowly permeable or very slowly permeable and nearly level are suitable for flood-type irrigation. Other soils require a sprinkler system to distribute the water.

Raising beef cattle is a major enterprise. Cattle feed mostly on native range. Most ranches supplement the grazing of native grasses with winter grazing of wheat and supplemental feedings of forage sorghum, hay, cake, or grain in winter and during periods of drought. Practically all ranches have cow herds and sell replacement or feeder calves at weaning time. If surplus feed is available, some calves are carried over for marketing later as stocker cattle. Many stocker cattle are bought each fall to graze winter wheat until spring, when they are sold. A few horses, swine, and sheep also are raised in the county.

Glossary

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Available water capacity (also termed available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

Caliche. A more or less cemented deposit of calcium carbonate in many soils of warm-temperate areas, as in the Southwestern States. The material may consist of soft, thin layers in the soil or of hard, thick beds just beneath the solum, or it may be exposed at the surface by erosion.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of clay on the surface of a soil aggregate. Synonyms: clay coat, clay skin.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrations of compounds, or of soil grains cemented together. The composition of some concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are examples of material commonly found in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

Drainage class (natural). Refers to the conditions of frequency and duration of periods of saturation or partial saturation that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven different classes of natural soil drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have a low water-holding capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They

TABLE 8.—*Temperature*

[All data from Follett; elevation, 2,780 ft; based on data

Month	Temperature					Probability of receiving—		
	Average daily maximum	Average maximum	Average daily minimum	Average minimum	Average total [1]	0 or more	0.5 in or more	1 in or more
	°F	°F	°F	°F	In	Pct	Pct	Pct
January	47.2	70.5	20.5	0.3	0.53	10	50	23
February	51.6	74.3	24.4	6.0	.86	10	54	28
March	58.2	82.0	29.7	11.5	1.21	11	63	37
April	70.2	89.1	41.4	27.9	1.18	1	93	73
May	78.4	93.5	52.4	39.1	3.59	<1	97	93
June	87.6	99.9	61.6	50.8	3.65	<1	93	83
July	92.4	102.2	66.4	58.7	3.56	<1	85	70
August	92.1	102.6	64.7	55.4	2.43	<1	91	81
September	83.9	96.8	56.7	44.4	1.85	7	75	62
October	74.0	92.3	45.6	32.6	1.45	6	73	73
November	59.5	78.8	32.1	16.6	.71	15	41	25
December	49.4	71.1	24.0	6.3	.55	11	52	32
Year	70.4		43.3		21.57			

[1] Average length of record, 21 years.
[2] Average length of record, 14 years.

have uniform color in the A and upper B horizons and have mottling in the lower B and the C horizons.

Somewhat poorly drained soils are wet for significant periods but not all the time, and some soils commonly have mottling at a depth below 6 to 16 inches.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Diversion, or diversion terrace. A ridge of earth, generally a terrace, that is built to divert runoff from its natural course and, thus, to protect areas downslope from the effects of such runoff.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to relatively level plots surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops, or in orchards, to confine the flow of water to one direction.

Furrow.—Water is applied in small ditches made by cultivation implements used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Irrigation water, released at high points, flows onto the field without controlled distribution.

Mottling, soil. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: Abundance—*few*, *common*, and *many*; size—*fine*, *medium*, and *coarse*; and contrast—*faint*, *distinct*, and *prominent*. The size measurements are these: *fine*, less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium*, ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along

and precipitation

for the period 1949–69. The symbol < means less than]

Precipitation										
Probability of receiving—Continued					Average number of days with—[2]			Snow and sleet		
2 in or more	3 in or more	4 in or more	5 in or more	6 in or more	0.1 in or more	0.5 in or more	1 in or more	Average total[1]	Greatest monthly[1]	Greatest depth[2]
Pct	*Pct*	*Pct*	*Pct*	*Pct*				*In*	*In*	*In*
5	1	<1	<1	<1	1	0	0	1.3	8.2	8
5	1	<1	<1	<1	2	(3)	(3)	5.0	21.2	10
14	7	2	<1	<1	3	1	(3)	2.2	28.5	10
30	10	4	<1	<1	3	1	(3)	.2	3.5	0
73	53	42	26	15	6	2	1	0	0	0
61	42	22	11	11	6	3	1	0	0	0
48	30	19	11	6	6	2	1	0	0	0
52	28	15	8	4	4	2	1	0	0	0
35	22	12	7	4	3	1	1	0	0	0
32	20	11	6	4	2	1	(3)	(4)	(4)	0
8	3	2	<1	<1	2	1	(3)	.7	6.5	----
14	6	3	2	<1	2	(3)	(3)	1.5	7.0	----
					40	14	5	10.9	28.5	10

[3] Less than one-half day.
[4] Trace.

the greatest dimension; and *coarse*, more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Munsell notation. A system for designating color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with a hue of 10YR, a value of 6, and a chroma of 4.

Ped. An individual natural soil aggregate, such as a crumb, a prism, or a block, in contrast to a clod.

Permeability. The quality that enables the soil to transmit water or air. Terms used to describe permeability are as follows: *very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

Phase, soil. A subdivision of a soil, series, or other unit in the soil classification system made because of differences in the soil that affect its management but do not affect its classification in the natural landscape. A soil type, for example, may be divided into phases because of differences in slope, stoniness, thickness, or some other characteristic that affects its management but not its behavior in the natural landscape.

pH value. A numerical means for designating acidity and alkalinity in soils. A pH value of 7.0 indicates precise neutrality; a higher value, alkalinity; and a lower value, acidity.

Plinthite. The sesquioxide-rich, humus-poor, highly weathered mixture of clay with quartz and other diluents that commonly shows as red mottles, usually in platy, polygonal, or reticulate patterns. Plinthite changes irreversibly to hardpan or to irregular aggregates upon repeated wetting and drying, or it is the hardened relicts of the soft, red mottles. It is a form of laterite.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5.0	Mildly alkaline	7.4 to 7.8
Strongly acid	5.1 to 5.5	Moderately alkaline	7.9 to 8.4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	9.1 and higher

Sand. Individual rock or mineral fragments in a soil that range in diameter from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

Series, soil. A group of soils developed from a particular type of parent material and having genetic horizons that, except for texture of the surface layer, are similar in differentiating characteristics and in arrangement in the profile.

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils

are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it may soak into the soil or flow slowly to a prepared outlet without harm. Terraces in fields are generally built so they can be farmed. Terraces intended mainly for drainage have a deep channel that is maintained in permanent sod.

Terrace (geological). An old alluvial plain, ordinarily flat or undulating, bordering a river, lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Tilth, soil. The condition of the soil in relation to the growth of plants, especially soil structure. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable, granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

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U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

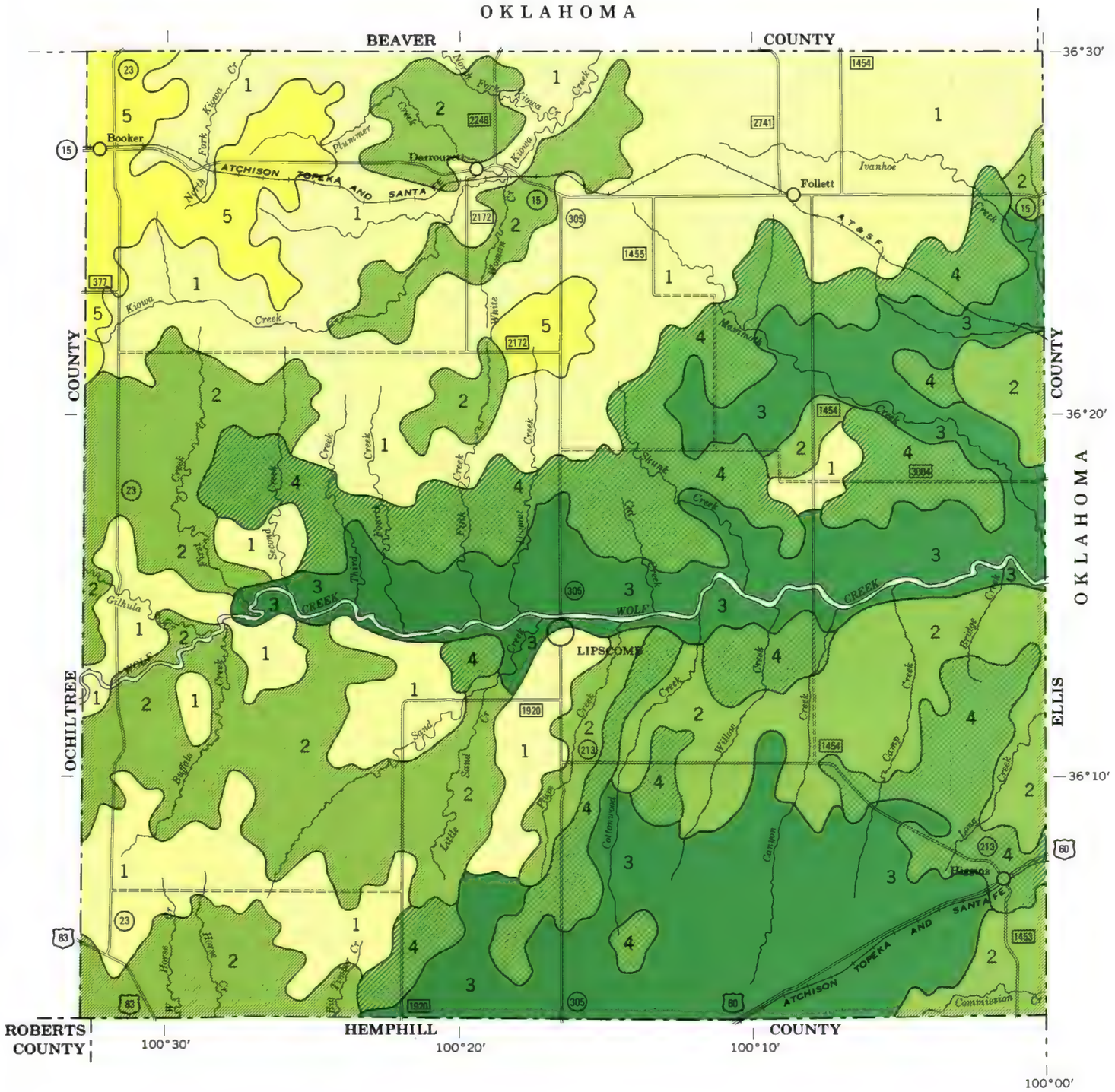
TEXAS AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

LIPSCOMB COUNTY, TEXAS

Scale 1:253,440

1 0 1 2 3 4 Miles



N

SOIL ASSOCIATIONS *

1 — Acuff-Olton-Darrouzett association: Deep, nearly level to gently sloping, medium textured to moderately fine textured soils

2 — Mobeetie-Potter-Berda association: Deep to very shallow, gently sloping to moderately steep, moderately coarse textured to medium textured soils

3 — Devol-Tivoli-Likes association: Deep, gently sloping to steep, coarse-textured soils

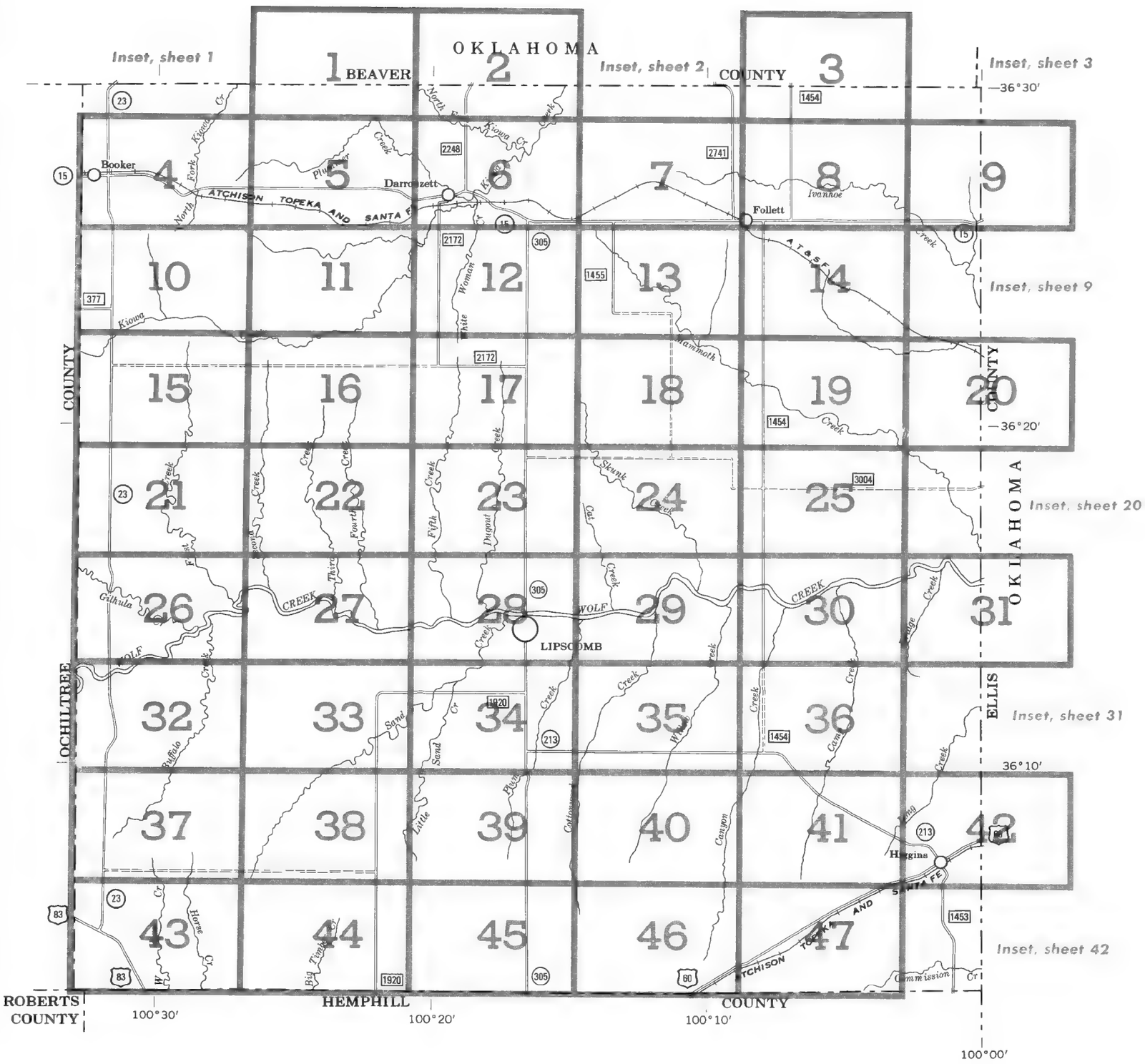
4 — Grandfield-Veal association: Deep, gently sloping, moderately coarse textured to medium textured soils

5 — Pullman-Darrouzett-Estacado association: Deep, nearly level to gently sloping, moderately fine textured soils

* Texture terms refer to the surface layer of the major soils in each soil association.

Compiled 1973

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



INDEX TO MAP SHEETS

LIPSCOMB COUNTY, TEXAS

Scale 1:253,440

1 0 1 2 3 4 Miles

N

SOIL LEGEND

The first capital letter is the initial one of the soil name. A second capital letter, A, B, C, or D, shows the slope. Most symbols without a slope letter are those of nearly level soils, but some are for soils that have a considerable range of slope. A final number, 3, in the symbol, shows that the soil is severely eroded. (W) following the soil name indicates that signs of erosion, especially of local shifting of soil by wind, are evident in places, but the degree of erosion cannot be estimated reliably.

SYMBOL	NAME
AcB	Acuff loam, 1 to 3 percent slopes
AcC	Acuff loam, 3 to 5 percent slopes
AlA	Altus fine sandy loam, 0 to 1 percent slopes
BdB	Berda loam, 1 to 3 percent slopes
BeD	Berda and Potter soils, rolling *
BrA	Bippus clay loam, 0 to 1 percent slopes
BrB	Bippus clay loam, 1 to 3 percent slopes
BuB	Bippus fine sandy loam, 1 to 3 percent slopes
DaA	Darrouzett silty clay loam, 0 to 1 percent slopes
DaB	Darrouzett silty clay loam, 1 to 3 percent slopes
DaC	Darrouzett silty clay loam, 3 to 5 percent slopes
DeD	Devol loamy fine sand, 3 to 8 percent slopes (W)
DsC3	Devol and Springer soils, undulating, severely eroded
EsB	Estacado silty clay loam, 1 to 3 percent slopes
EtB	Estacado-Olton complex, 0 to 3 percent slopes
GrB	Grandfield fine sandy loam, 1 to 3 percent slopes
GrC	Grandfield fine sandy loam, 3 to 5 percent slopes
Gu	Guadalupe fine sandy loam
LkC	Likes loamy fine sand, undulating (W)
Ln	Lincoln soils (W)
McB	Mansker loam, 1 to 3 percent slopes
MrB	Mobeetie fine sandy loam, 1 to 3 percent slopes
MrC	Mobeetie fine sandy loam, 3 to 5 percent slopes
MrD	Mobeetie fine sandy loam, 5 to 8 percent slopes
MxD	Mobeetie-Potter association, rolling *
OlB	Olton clay loam, 1 to 3 percent slopes
OlC	Olton clay loam, 3 to 5 percent slopes
PaA	Paloduro loam, 0 to 1 percent slopes
PaB	Paloduro loam, 1 to 3 percent slopes
PaC	Paloduro loam, 3 to 5 percent slopes
PbD	Paloduro, Veal and Berda soils, rolling *
PdC	Paloduro, Veal, and Portales soils, 3 to 5 percent slopes
PoB	Portales clay loam, 1 to 3 percent slopes
PrD	Potter soils, rolling
PuA	Pullman silty clay loam, 0 to 1 percent slopes
PuB	Pullman silty clay loam, 1 to 3 percent slopes
Ra	Randall clay
SlB	Springer loamy fine sand, 0 to 3 percent slopes (W)
Sp	Spur soils
Sw	Sweetwater soils
TpA	Tipton loam, 0 to 1 percent slopes
TpB	Tipton loam, 1 to 3 percent slopes
Tv	Tivoli fine sand (W)
VeB	Veal loam, 1 to 3 percent slopes
VeC	Veal loam, 3 to 5 percent slopes

* The delineations are much larger and the composition of these units is more variable than other map units in the county. Mapping has been controlled well enough, however, for the anticipated use of the soils.

CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Highways and roads
- Divided
- Good motor
- Poor motor
- Trail

Highway markers
- National Interstate
- U. S.
- State or county

Railroads
- Single track
- Multiple track
- Abandoned

Bridges and crossings
- Road
- Trail
- Railroad
- Ferry (FY)
- Ford (FORD)
- Grade
- R. R. over
- R. R. under

Buildings
- School
- Church

Mine and quarry

Gravel pit (G.P.)

Power line

Pipeline

Cemetery

Dams

Levee

Tanks

Well, oil or gas

Forest fire or lookout station

Windmill

Located object

BOUNDARIES

- National or state
- County
- Minor civil division
- Reservation
- Land grant
- Small park, cemetery, airport
- Land survey division corners

DRAINAGE

Streams, double-line
- Perennial
- Intermittent

Streams, single-line
- Perennial
- Intermittent
  - Crossable with tillage implements
  - Not crossable with tillage implements
  - Unclassified

Canals and ditches

Lakes and ponds
- Perennial (water, w)
- Intermittent (int)

Spring

Well, irrigation

Wet spot

Drainage end or alluvial fan

RELIEF

Escarpments
- Bedrock
- Other

Short steep slope

Prominent peak

Depressions

	Large	Small
Crossable with tillage implements		
Not crossable with tillage implements		
Contains water most of the time		

SOIL SURVEY DATA

- Soil boundary and symbol (Dx)
- Gravel
- Stoniness
  - Stony
  - Very stony
- Rock outcrops
- Chert fragments
- Clay spot
- Sand spot
- Gumbo or scabby spot
- Made land
- Severely eroded spot
- Blowout, wind erosion
- Gully

GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and that of the soil series to which the mapping unit belongs. Other information is given in tables as follows:

Acreage and extent, table 1, p. 8.
Predicted yields, table 2, p. 41.

Engineering uses of the soils, tables 4 and 5, pp. 48 through 59.

Map symbol	Mapping unit	Described on page	Capability unit Dryland Symbol	Dryland Page	Capability unit Irrigated Symbol	Irrigated Page	Range site Name	Range site Page
AcB	Acuff loam, 1 to 3 percent slopes--	8	IIIe-2	34	IIIe-2	39	Deep Hardland	42
AcC	Acuff loam, 3 to 5 percent slopes--	8	IVe-1	36	IIIe-6	39	Deep Hardland	42
AlA	Altus fine sandy loam, 0 to 1 percent slopes----------	9	IIe-3	34	IIe-3	38	Sandy Loam	43
BdB	Berda loam, 1 to 3 percent slopes----------	10	IIIe-2	34	IIIe-2	39	Hardland Slopes	42
BeD	Berda and Potter soils, rolling----	10						
	Berda soils----------	----	VIe-2	37	------	----	Hardland Slopes	42
	Potter soils----------	----	VIIs-1	38	------	----	Very Shallow	43
BrA	Bippus clay loam, 0 to 1 percent slopes----------	11	IIe-1	34	I-2	38	Deep Hardland	42
BrB	Bippus clay loam, 1 to 3 percent slopes----------	11	IIIe-2	34	IIe-2	38	Deep Hardland	42
BuB	Bippus fine sandy loam, 1 to 3 percent slopes----------	12	IIIe-4	35	IIIe-3	39	Sandy Loam	43
DaA	Darrouzett silty clay loam, 0 to 1 percent slopes----------	13	IIIe-3	35	I-1	38	Deep Hardland	42
DaB	Darrouzett silty clay loam, 1 to 3 percent slopes----------	13	IIIe-2	34	IIe-1	38	Deep Hardland	42
DaC	Darrouzett silty clay loam, 3 to 5 percent slopes----------	13	IVe-6	36	------	----	Deep Hardland	42
DeD	Devol loamy fine sand, 3 to 8 percent slopes----------	14	VIe-1	37	------	----	Sandyland	43
DsC3	Devol and Springer soils, undulating, severely eroded----------	15	VIIe-1	38	------	----	Sandyland	43
EsB	Estacado silty clay loam, 1 to 3 percent slopes----------	16	IIIe-2	34	IIIe-2	39	Hardland Slopes	42
EtB	Estacado-Olton complex, 0 to 3 percent slopes----------	16	IIIe-2	34	IIIe-2	39	Hardland Slopes	42
GrB	Grandfield fine sandy loam, 1 to 3 percent slopes----------	17	IIIe-4	35	IIIe-3	39	Sandy Loam	43
GrC	Grandfield fine sandy loam, 3 to 5 percent slopes----------	17	IIIe-8	36	IIIe-7	39	Sandy Loam	43
Gu	Guadalupe fine sandy loam----------	18	IIIe-4	35	IIe-3	38	Loamy Bottomland	42
LkC	Likes loamy fine sand, undulating----------	19	VIe-1	37	------	----	Sandyland	43
Ln	Lincoln soils----------	19	Vw-2	37	------	----	Sandy Bottomland	42
McB	Mansker loam, 1 to 3 percent slopes----------	20	IVe-2	36	IIIe-5	39	Hardland Slopes	42
MrB	Mobeetie fine sandy loam, 1 to 3 percent slopes----------	22	IIIe-6	35	IIIe-4	39	Mixedland Slopes	42
MrC	Mobeetie fine sandy loam, 3 to 5 percent slopes----------	22	IVe-3	36	IVe-1	40	Mixedland Slopes	42
MrD	Mobeetie fine sandy loam, 5 to 8 percent slopes----------	22	VIe-3	37	------	----	Mixedland Slopes	42
MxD	Mobeetie-Potter association, rolling----------	22						
	Mobeetie soils----------	----	VIe-3	37	------	----	Mixedland Slopes	42
	Potter soils----------	----	VIIs-1	38	------	----	Very Shallow	43
OlB	Olton clay loam, 1 to 3 percent slopes----------	23	IIIe-2	34	IIe-1	38	Deep Hardland	42
OlC	Olton clay loam, 3 to 5 percent slopes----------	23	IVe-6	36	------	----	Deep Hardland	42
PaA	Paloduro loam, 0 to 1 percent slopes----------	24	IIIe-7	36	I-2	38	Hardland Slopes	42
PaB	Paloduro loam, 1 to 3 percent slopes----------	24	IIIe-2	34	IIe-2	38	Hardland Slopes	42
PaC	Paloduro loam, 3 to 5 percent slopes----------	25	IVe-4	36	IVe-2	40	Hardland Slopes	42
PbD	Paloduro, Veal and Berda soils, rolling----------	25	VIe-2	37	------	----	Hardland Slopes	42
PdC	Paloduro, Veal, and Portales soils, 3 to 5 percent slopes----------	25	IVe-4	36	IVe-2	40	Hardland Slopes	42
PoB	Portales clay loam, 1 to 3 percent slopes----------	26	IIIe-2	34	IIIe-2	39	Deep Hardland	42
PrD	Potter soils, rolling----------	27	VIIs-1	38	------	----	Very Shallow	43
PuA	Pullman silty clay loam, 0 to 1 percent slopes----------	28	IIIe-5	35	IIs-1	38	Deep Hardland	42
PuB	Pullman silty clay loam, 1 to 3 percent slopes----------	28	IIIe-1	34	IIIe-1	39	Deep Hardland	42
Ra	Randall clay----------	29	VIw-1	37	------	----	----------	----
SlB	Springer loamy fine sand, 0 to 3 percent slopes----------	30	IVe-5	36	IVe-3	40	Sandyland	43
Sp	Spur soils----------	30	Vw-1	37	------	----	Loamy Bottomland	42
Sw	Sweetwater soils----------	31	Vw-3	37	------	----	Loamy Bottomland	42
TpA	Tipton loam, 0 to 1 percent slopes----------	31	IIe-1	34	I-2	38	Deep Hardland	42
TpB	Tipton loam, 1 to 3 percent slopes----------	32	IIe-2	34	IIe-2	38	Deep Hardland	42
Tv	Tivoli fine sand----------	32	VIIe-1	38	------	----	Deep Sand	42
VeB	Veal loam, 1 to 3 percent slopes------	33	IVe-2	36	IIIe-5	39	Hardland Slopes	42
VeC	Veal loam, 3 to 5 percent slopes------	33	IVe-4	36	IVe-2	40	Hardland Slopes	42

LIPSCOMB COUNTY, TEXAS — SHEET NUMBER 1

LIPSCOMB COUNTY, TEXAS NO. 1

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.
Land division corners are approximately positioned on this map.

2 280 000 FEET

911 000 FEET

OCHILTREE COUNTY

BEAVER COUNTY OKLAHOMA

(Joins sheet 4)

2 305 000 FEET

906 000 FEET

(Joins lower left)

2 310 000 FEET

913 000 FEET

(Joins upper right)

(Joins sheet 5)

2 335 000 FEET

908 000 FEET

(Joins sheet 2)

N

2 Miles

10 000 Feet

5 000

Scale 1:24 000

LIPSCOMB COUNTY, TEXAS — SHEET NUMBER 2

2

N

2 Miles

10 000 Feet

1

5 000

Scale 1:24 000

2 395 000 FEET

913 000 FEET

BEAVER COUNTY OKLAHOMA

(Joins lower right)

908 000 FEET

(Joins sheet 3)

2 370 000 FEET

(Joins sheet 7)

BeD

2 340 000 FEET

(Joins sheet 6)

907 000 FEET

(Joins sheet 1)

2 365 000 FEET

912 000 FEET

(Joins upper left)

North Fork Kiowa Creek

Kiowa Creek

Land division corners are approximately positioned on this map.

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LIPSCOMB COUNTY, TEXAS NO. 2

LIPSCOMB COUNTY, TEXAS NO. 3

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Land division corners are approximately positioned on this map.

(4)

LIPSCOMB COUNTY, TEXAS — SHEET NUMBER 4

(Joins inset, sheet 1)

(Joins sheet 10)

(Joins sheet 5)

2 310 000 FEET

905 000 FEET

2 285 000 FEET

890 000 FEET

N

Scale 1:24 000

2 Miles 10 000 Feet

1 5 000

COUNTY

OCHILTREE

0 0

¼ 1 000

½ 2 000 3 000

¾ 4 000

1 5 000

59 60 61 62 63

118 117 116 115 114

147 148 149 150 151

1174 1173 1172 1171 1170

BOOKER

BOOKER AIRFIELD

ATCHISON TOPEKA AND SANTA FE

Kiowa Creek

North Fork

GRAVEL PIT

DaA EtB PdC BrB DaB EsB PuA PuB McB BeD PbD Ra BrA OlB

Land division corners are approximately positioned on this map.

Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

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LIPSCOMB COUNTY, TEXAS NO. 4

LIPSCOMB COUNTY, TEXAS — SHEET NUMBER 5

LIPSCOMB COUNTY, TEXAS NO. 5

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Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.
Land division corners are approximately positioned on this map.

2 310 000 FEET

905 000 FEET

(Joins sheet 1)

(Joins sheet 4)

(Joins sheet 6)

(Joins sheet 11)

2 335 000 FEET

890 000 FEET

64 65 66 67 68 69

113 112 111 110 109 108

152 153 154 155 156 157

1169 1068 1067 1166 1165 1164

ATCHISON TOPEKA SANTA FE

Plummer Creek

5

N

Scale 1:24 000

2 Miles 1 0 1

10 000 Feet 5 000 0

1/4 1/2 3/4 1

1 000 2 000 3 000 4 000 5 000

LIPSCOMB COUNTY, TEXAS — SHEET NUMBER 6

N

(Joins sheet 2)

2 340 000 FEET

2 365 000 FEET

1 905 000 FEET

1 890 000 FEET

(Joins sheet 5)

(Joins sheet 7)

(Joins sheet 12)

Scale 1:24 000

2 Miles 1 0 10 000 Feet

1 5 000 0 1 000

¼ 2 000

½ 3 000

¾ 4 000

1 5 000

Land division corners are approximately positioned on this map.

Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

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LIPSCOMB COUNTY, TEXAS — SHEET NUMBER 7

LIPSCOMB COUNTY, TEXAS NO. 7

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.
Land division corners are approximately positioned on this map.

2 370 000 FEET

905 000 FEET

(Joins sheet 6)

(Joins inset, sheet 2)

(Joins sheet 8)

(Joins sheet 13)

2 395 000 FEET

890 000 FEET

TOPEKA AND SANTA FE

ATCHISON

Canhoe Creek

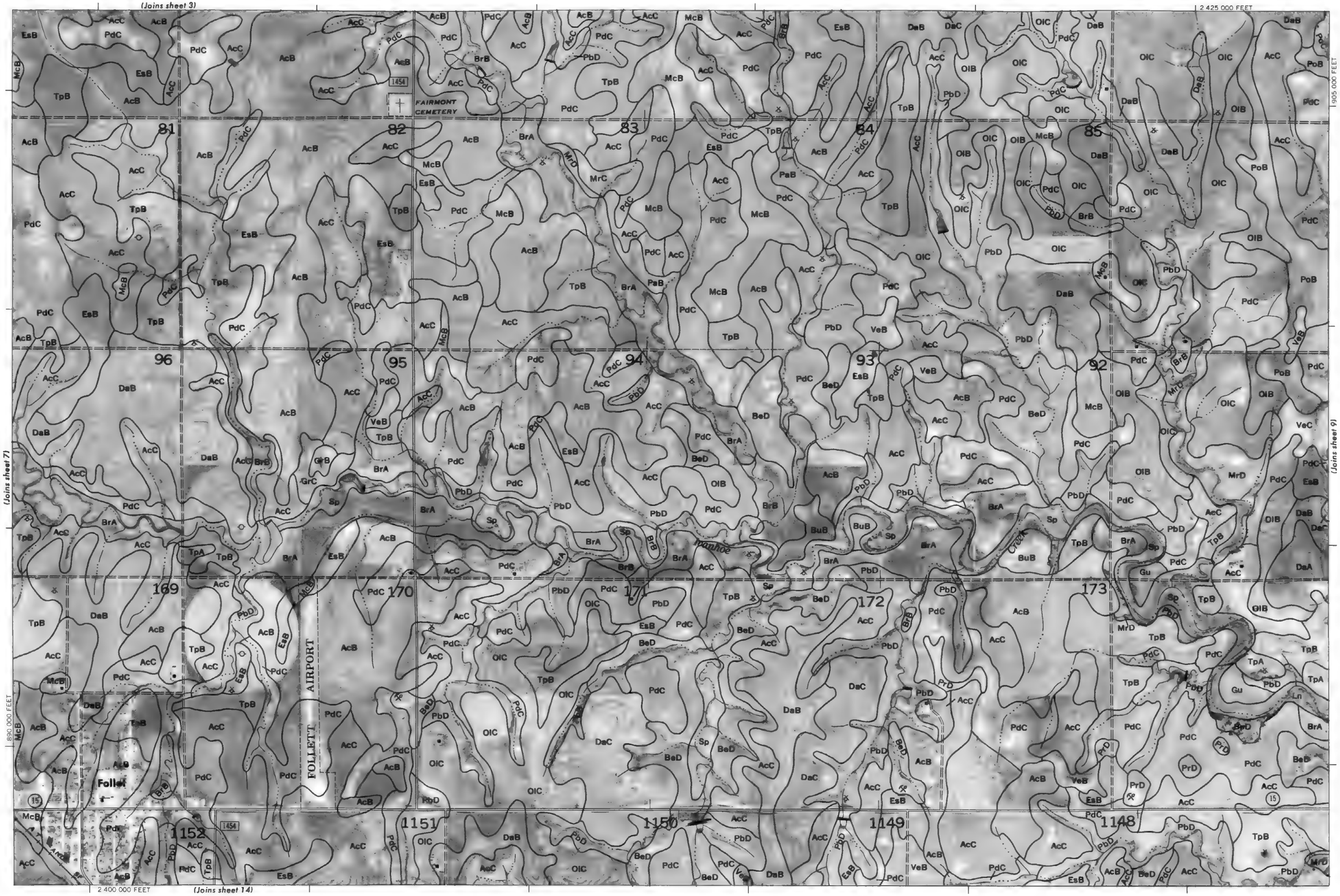
7

N

Scale 1:24 000

2 Miles

10 000 Feet



N

Scale 1:24 000

2 Miles 10 000 Feet

1 5 000 0

¼ 1 000

½ 2 000

¾ 3 000

1 4 000 5 000

Land division corners are approximately positioned on this map.

Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

LIPSCOMB COUNTY, TEXAS NO. 8

LIPSCOMB COUNTY, TEXAS — SHEET NUMBER 9

LIPSCOMB COUNTY, TEXAS NO. 9

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Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.
Land division corners are approximately positioned on this map.

9

N

2 Miles
10,000 Feet
1 5000

Scale 1:24 000

1 5 000 4 000 3 000 2 000 1 000 0 0 1 000 2 000 3 000 4 000 5 000

2 430 000 FEET

905 000 FEET

885 000 FEET

890 000 FEET

870 000 FEET

(Joins inset, sheet 3)

(Joins sheet 8)

(Joins upper right)

(Joins lower left)

(Joins sheet 14)

(Joins sheet 20)

OKLAHOMA

ELLIS COUNTY

Ivanhoe

Creek

GRAVEL PIT

ATCHISON, TOPEKA AND SANTA FE

86 87 88 89 90 91 174 175 176 1142 1143 1144 1145 1146 1147 1054 1055 1056 1057 1058 1059

LIPSCOMB COUNTY, TEXAS — SHEET NUMBER 10

(10)

N

2 Miles

10 000 Feet

1

5 000

Scale 1:24.000

0 0

¼ 1 000

½ 2 000 3 000

¾ 4 000

1 5 000

870 000 FEET

(Joins sheet 4)

2 310 000 FEET

885 000 FEET

(Joins sheet 15)

2 285 000 FEET

OCHILTREE COUNTY

1115 1116 1117 1118 1119

1086 1085 1084 1083 1082

1027 1028 1029 1030 1031

Kiowa Creek

KIOWA CEMETERY

VIEW POINT CEMETERY

377

Land division corners are approximately positioned on this map.

Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

(Joins sheet 11)

LIPSCOMB COUNTY, TEXAS NO. 10

LIPSCOMB COUNTY, TEXAS — SHEET NUMBER 11

LIPSCOMB COUNTY, TEXAS NO. 11

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Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.
Land division corners are approximately positioned on this map.

2 310 000 FEET

885 000 FEET

(Joins sheet 10)

(Joins sheet 5)

(Joins sheet 12)

(Joins sheet 16)

2 335 000 FEET

870 000 FEET

1120 1121 1122 1123 1124 1125

1081 1080 1079 1078 1077 1076

1032 1033 1074 1035 1036 1037

Kiowa Creek

11

N

Scale 1:24 000

2 Miles

10 000 Feet

5 000

LIPSCOMB COUNTY, TEXAS — SHEET NUMBER 12

(12)

N

(Joins sheet 6)

2 365 000 FEET

1885 000 FEET

2 Miles

10 000 Feet

Scale 1:24.000

1 5 000

0 0

¼ 1 000

½ 2 000

¾ 3 000

1 4 000

5 000

870 000 FEET

2 340 000 FEET

(Joins sheet 11)

(Joins sheet 13)

(Joins sheet 17)

1126 1127 1128 1129 1130

1075 1074 1073 1072 1071

1038 1039 1040 1041 1042

Kiowa Creek

Woman

White

2172

305

Land division corners are approximately positioned on this map.

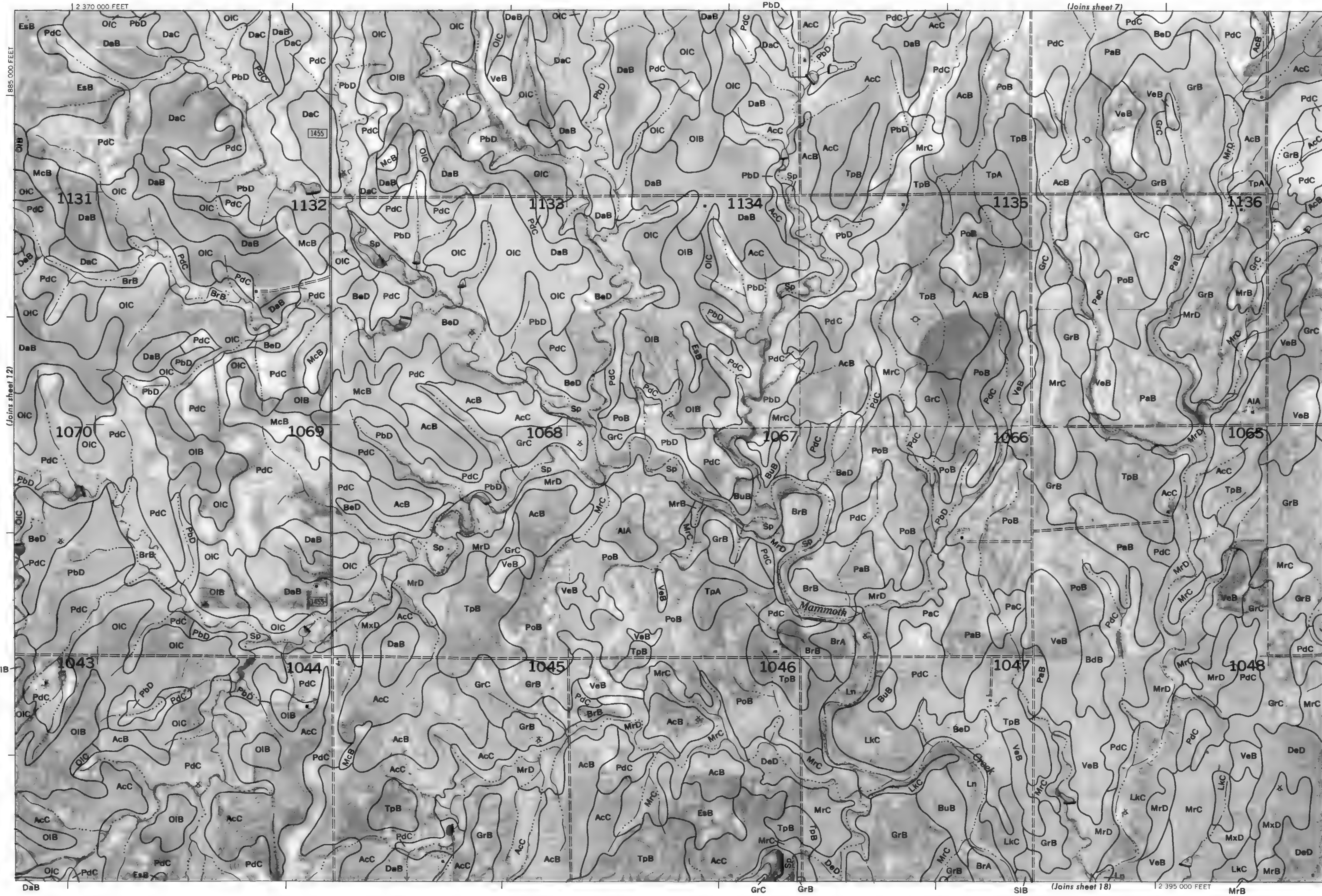
Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

LIPSCOMB COUNTY, TEXAS NO. 12

LIPSCOMB COUNTY, TEXAS — SHEET NUMBER 13

(13)



N

Scale 1:24 000

0 ¼ ½ ¾ 1 2 Miles

5000 0 1000 2000 3000 4000 5000 10 000 Feet

LIPSCOMB COUNTY, TEXAS NO. 13

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.
Land division corners are approximately positioned on this map.

LIPSCOMB COUNTY, TEXAS — SHEET NUMBER 14

14

N

Scale 1:24,000

2 Miles 10,000 Feet 5,000

1 0 1/4 0 1/2 1,000 3/4 2,000 1 3,000 4,000 5,000

(Joins sheet 8)

(Joins sheet 13)

(Joins sheet 19)

(Joins inset, sheet 9)

2,425,000 FEET

885,000 FEET

870,000 FEET

2,400,000 FEET

1137 1138 1139 1140 1141

1064 1063 1062 1061 1060

1049 1050 1051 1052 1053

ATCHISON TOPEKA AND SANTA FE

1454

Land division corners are approximately positioned on this map.

Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

LIPSCOMB COUNTY, TEXAS NO. 14

LIPSCOMB COUNTY, TEXAS — SHEET NUMBER 15

LIPSCOMB COUNTY, TEXAS NO. 15

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.
Land division corners are approximately positioned on this map.

2 285 000 FEET

865 000 FEET

(Joins sheet 10)

OCHILTREE COUNTY

998 997 996 995 994

939 940 941 942 943

910 909 908 907 906

851 852 853 854 855

Kiowa Creek

Kiowa Creek

Rytst Creek

(Joins sheet 16)

(Joins sheet 21)

2 310 000 FEET

850 000 FEET

15

N

Scale 1:24 000

2 Miles

10 000 Feet

1 5 000 0 1 000 2 000 3 000 4 000 5 000

LIPSCOMB COUNTY, TEXAS — SHEET NUMBER 16

16

N

Scale 1:24 000

2 Miles 10 000 Feet 1 5 000

1 5 000 4 000 3 000 2 000 1 000 0 0 ¼ ½ ¾ 1

(Joins sheet 15)

(Joins sheet 17)

(Joins sheet 22)

2 335 000 FEET

865 000 FEET

850 000 FEET

2 315 000 FEET

Land division corners are approximately positioned on this map

Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

LIPSCOMB COUNTY, TEXAS NO. 16

LIPSCOMB COUNTY, TEXAS — SHEET NUMBER 17

LIPSCOMB COUNTY, TEXAS NO. 17

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.
Land division corners are approximately positioned on this map.

2 340 000 FEET

1 865 000 FEET

(Joins sheet 16)

(Joins sheet 12)

(Joins sheet 18)

(Joins sheet 23)

2 365 000 FEET

1 850 000 FEET

17

N

Scale 1:24 000

2 Miles

10 000 Feet

5 000

1

0

1/4

1/2

3/4

1 000

2 000

3 000

4 000

5 000

(Joins sheet 13)

2 395 000 FEET

865 000 FEET

(Joins sheet 17)

(Joins sheet 19)

N

Scale 1:24 000

2 Miles 1 0

10 000 Feet 5 000 0

¼ 1 000 0

½ 2 000 3 000

¾ 4 000 5 000

1 850 000 FEET

2 370 000 FEET

(Joins sheet 24)

Land division corners are approximately positioned on this map.

Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

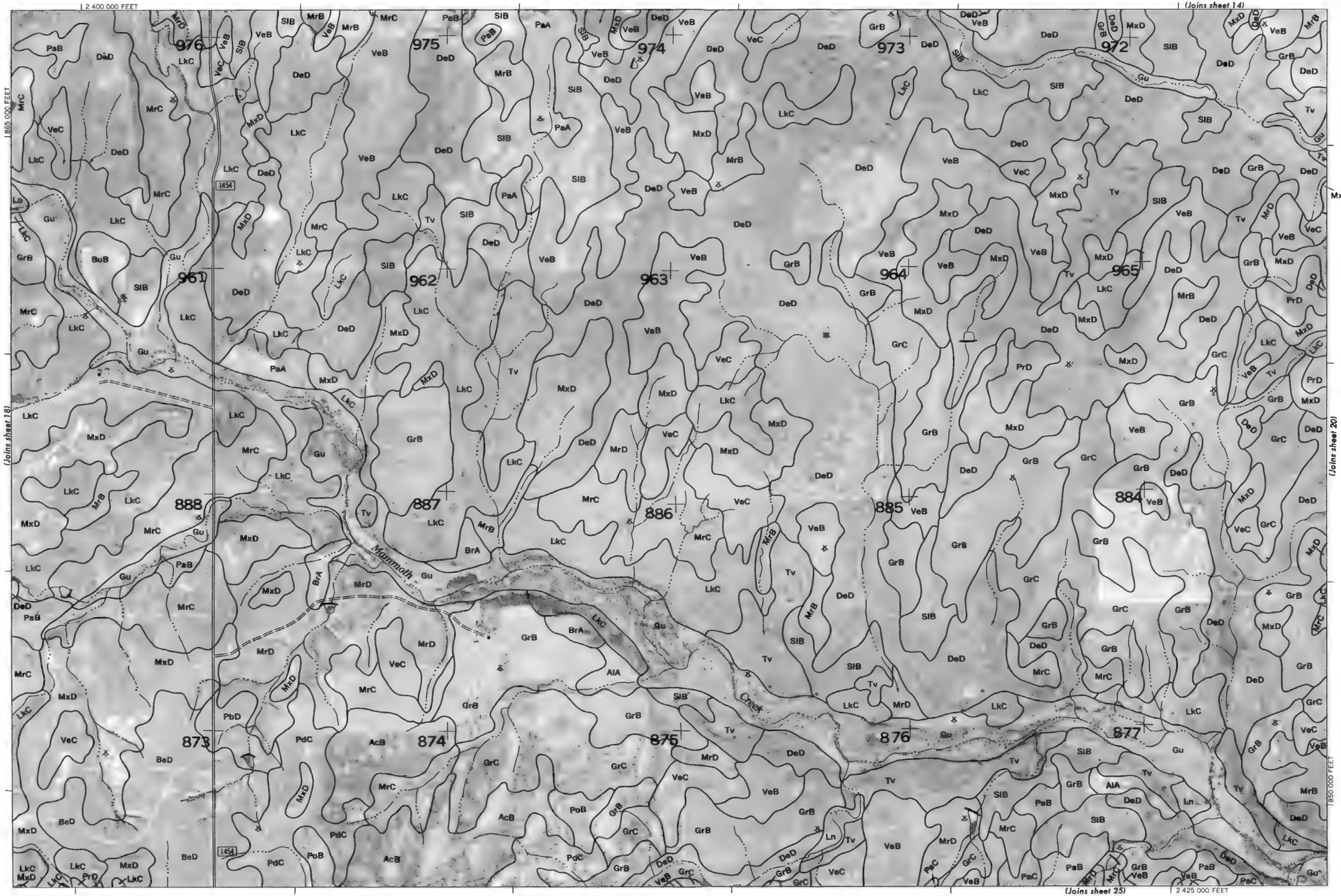
This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

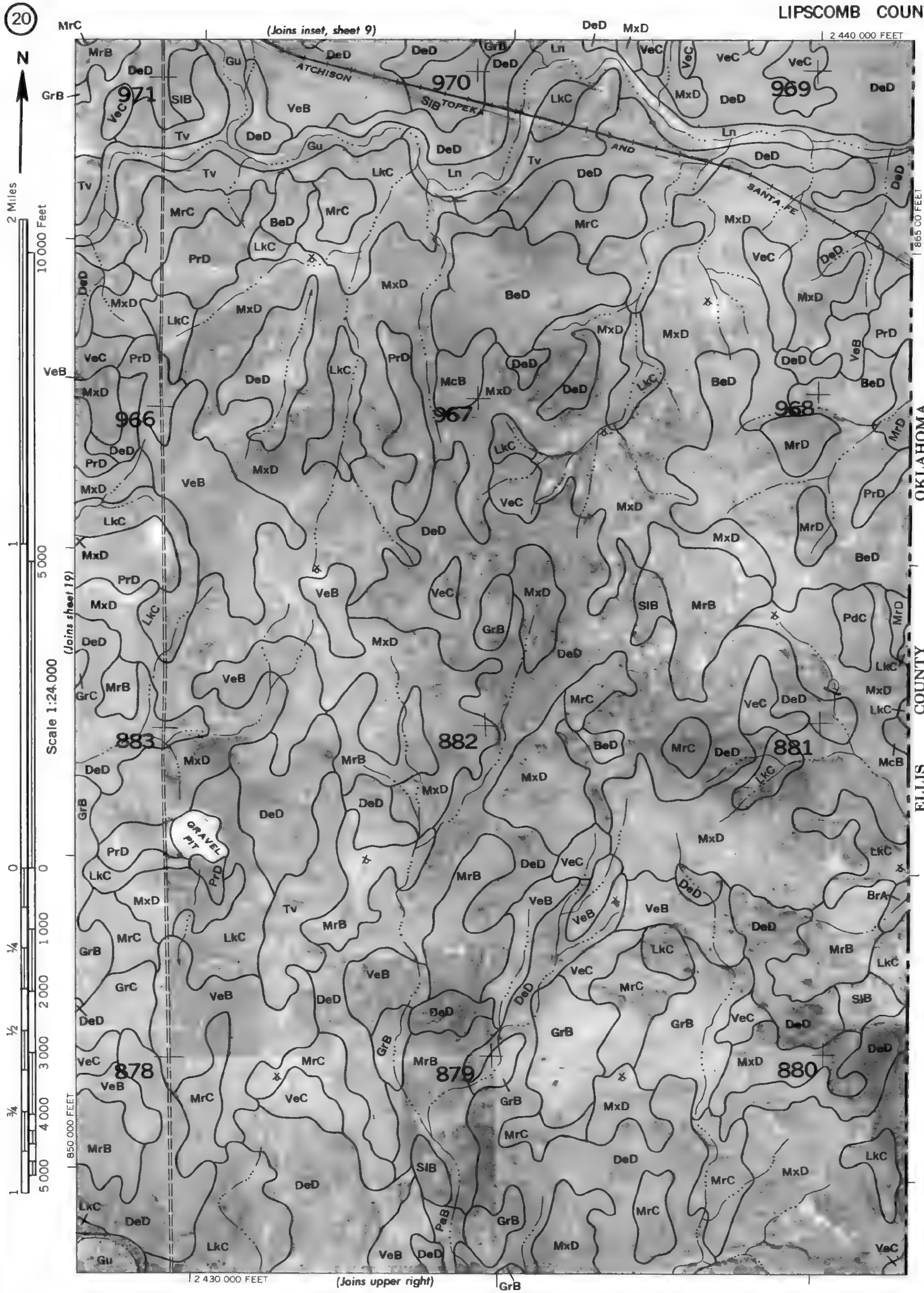
LIPSCOMB COUNTY, TEXAS NO. 18

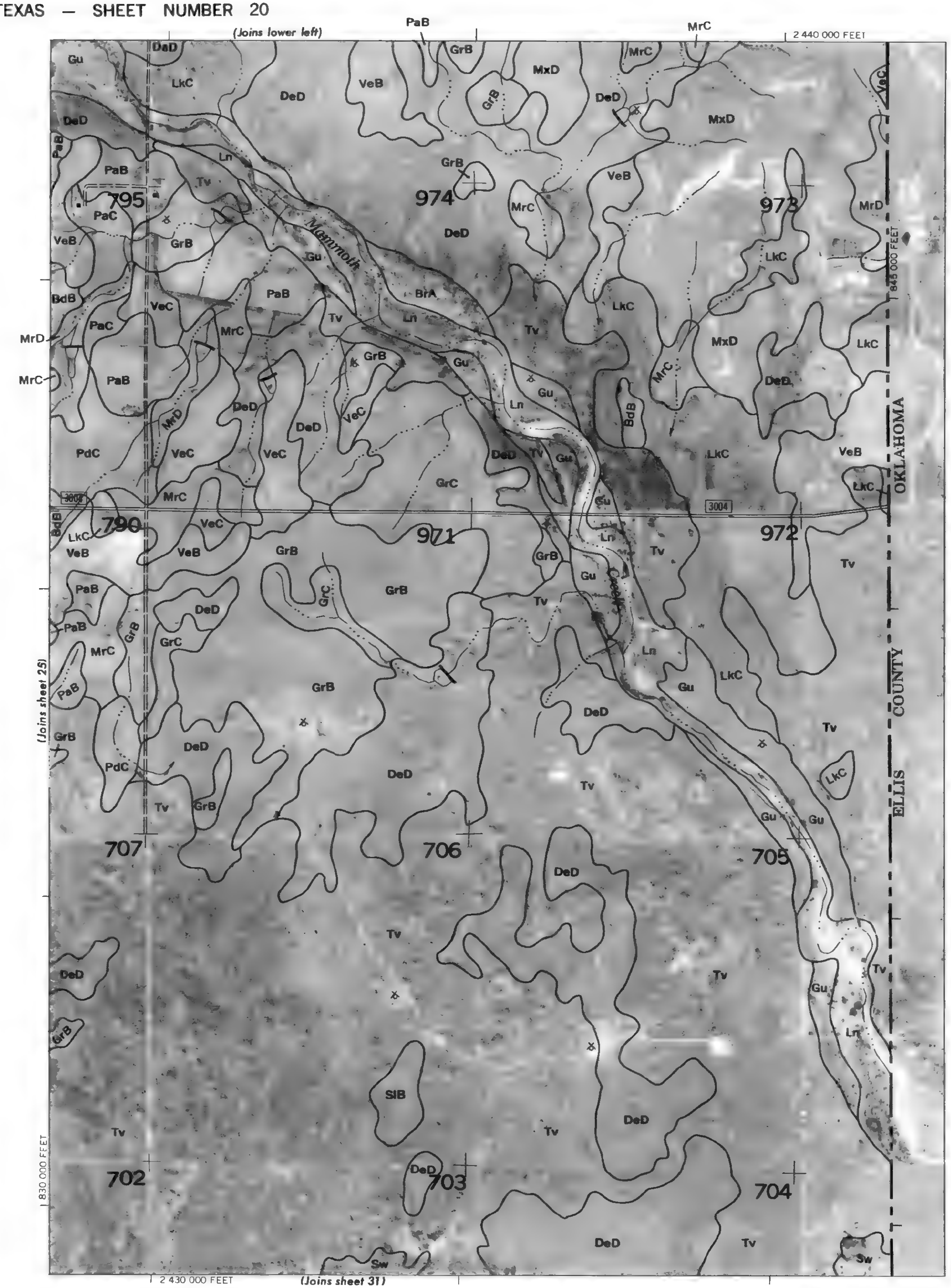
LIPSCOMB COUNTY, TEXAS — SHEET NUMBER 19

LIPSCOMB COUNTY, TEXAS NO. 19

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.
Land division corners are approximately positioned on this map.







Land division corners are approximately positioned on this map.
Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.
This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

LIPSCOMB COUNTY, TEXAS — SHEET NUMBER 21

LIPSCOMB COUNTY, TEXAS NO. 21

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.
Land division corners are approximately positioned on this map.

2 285 000 FEET

845 000 FEET

(Joins sheet 15)

OCHILTREE COUNTY

822 821 820 819 818

763 764 765 766 767

734 733 732 731 730

675 676 677 678 679

830 000 FEET

(Joins sheet 26)

2 310 000 FEET

(Joins sheet 22)

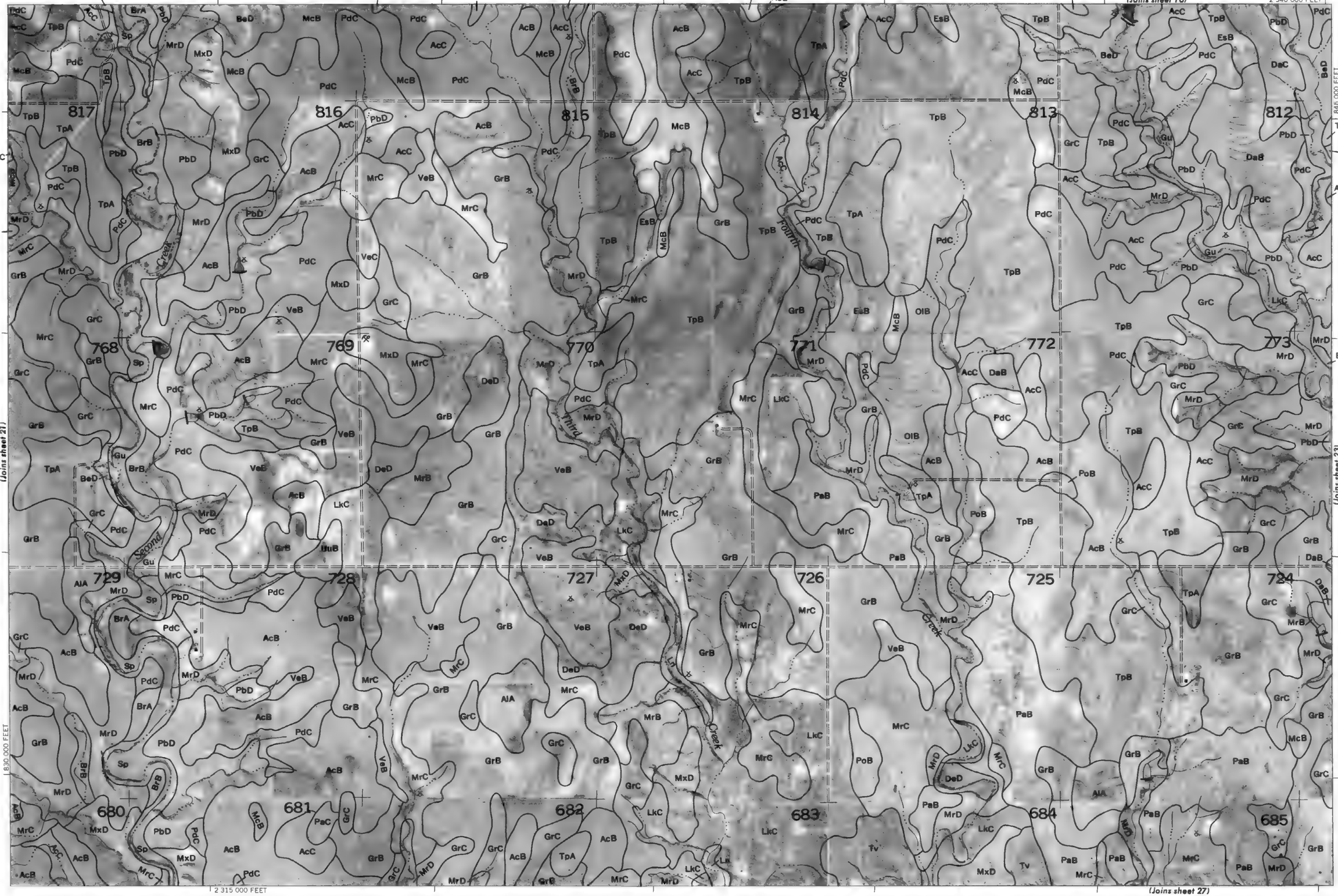
21

N

2 Miles

10 000 Feet

Scale 1:24 000



Land division corners are approximately positioned on this map.

Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

LIPSCOMB COUNTY, TEXAS NO. 22

LIPSCOMB COUNTY, TEXAS — SHEET NUMBER 23

23

N

2 340 000 FEET

845 000 FEET

(Joins sheet 17)

(Joins sheet 22)

(Joins sheet 24)

2 365 000 FEET

(Joins sheet 28)

830 000 FEET

Creek

Fork

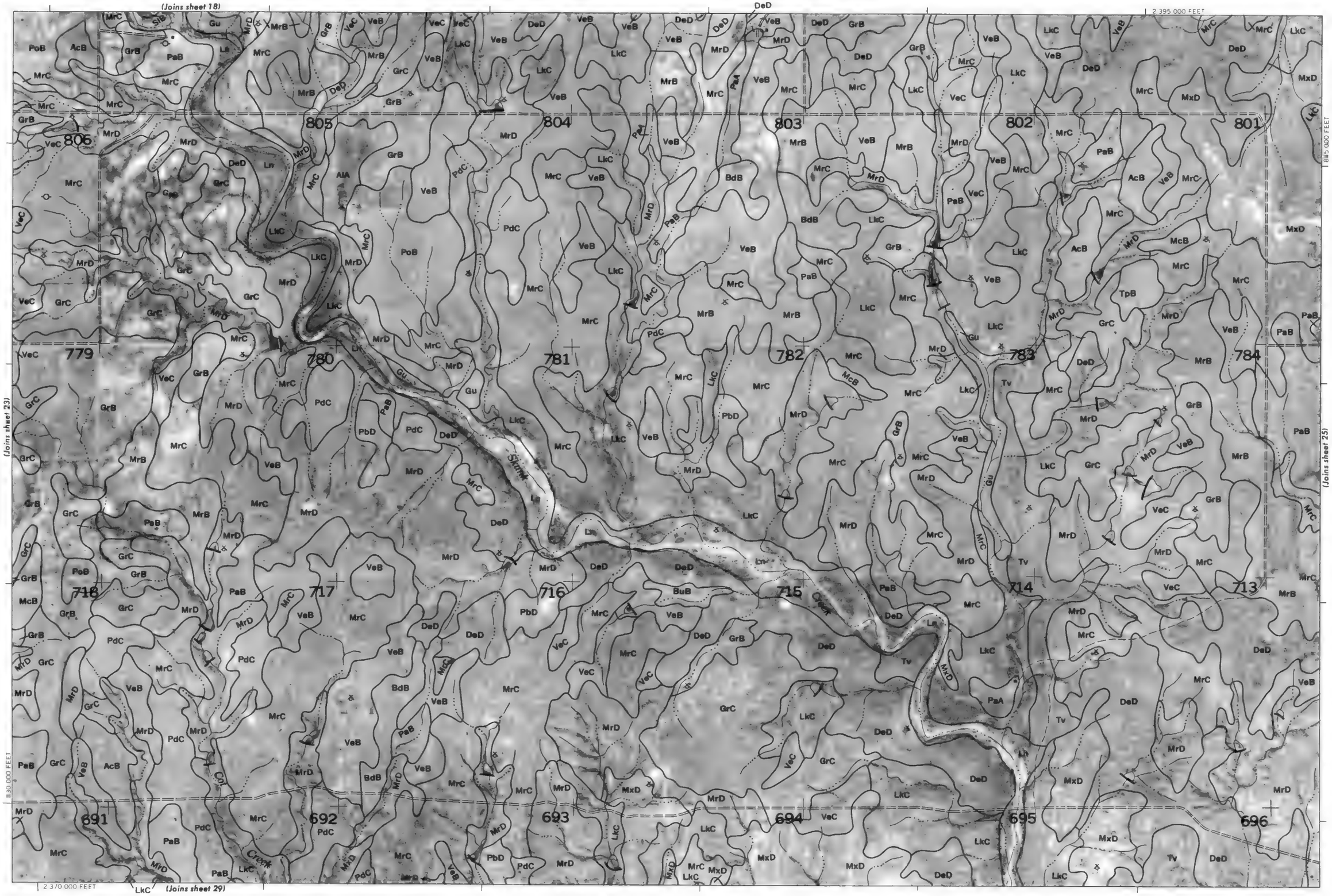
Dugout

GRAVEL PIT

LIPSCOMB COUNTY, TEXAS NO. 23

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.
Land division corners are approximately positioned on this map.

2 Miles
10,000 Feet
1
5,000
Scale 1:24 000
0
0
¼
1 000
½
2 000
¾
3 000
1
4 000
5 000



Land division corners are approximately positioned on this map

Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station

LIPSCOMB COUNTY, TEXAS NO. 24

LIPSCOMB COUNTY, TEXAS — SHEET NUMBER 25

LIPSCOMB COUNTY, TEXAS NO. 25

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.
Land division corners are approximately positioned on this map.

2 400 000 FEET

845 000 FEET

(Joins sheet 24)

(Joins sheet 19)

(Joins sheet 20)

(Joins sheet 30)

2 425 000 FEET

830 000 FEET

25

N

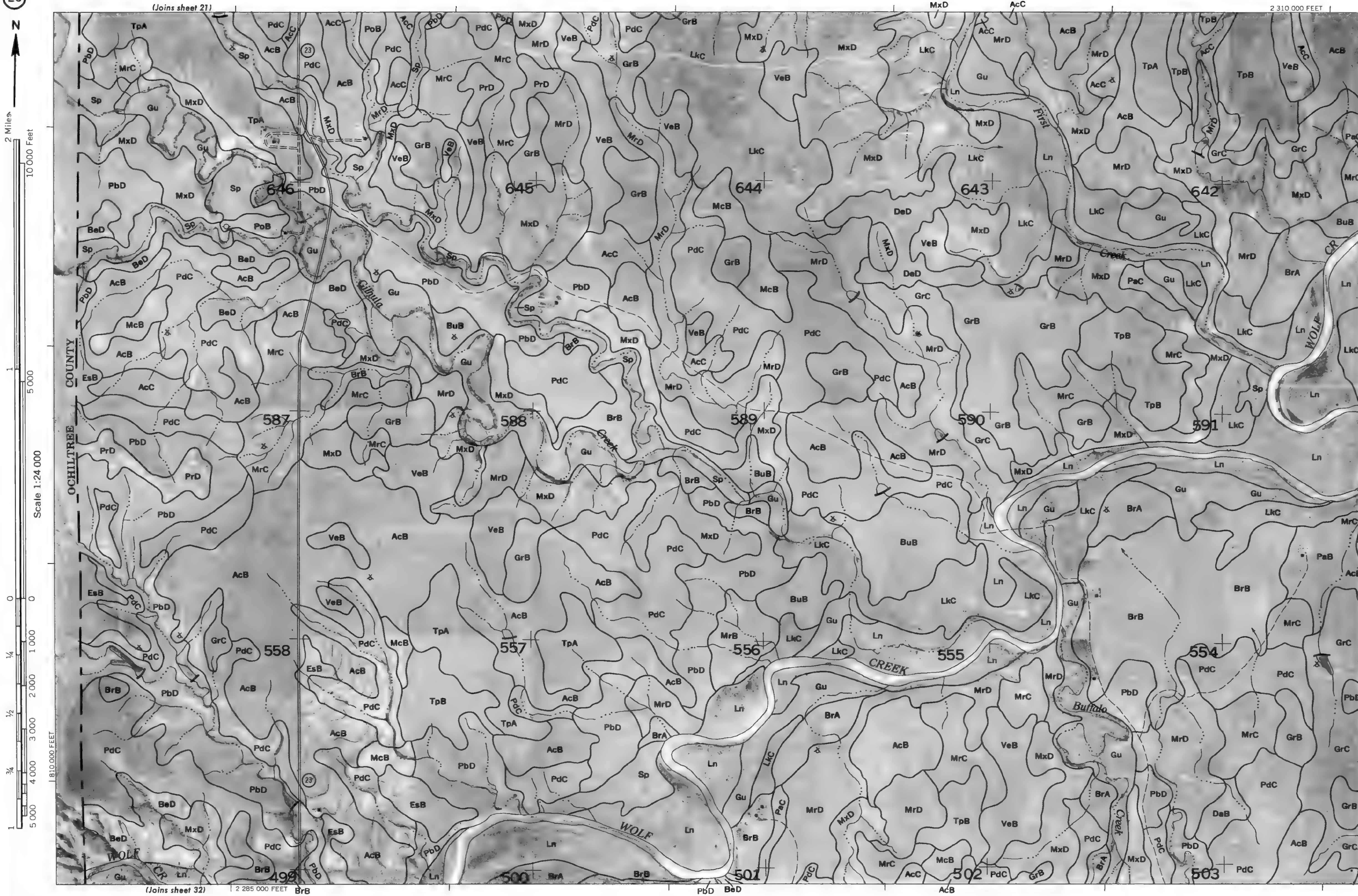
Scale 1:24 000

2 Miles

10 000 Feet

5 000

LIPSCOMB COUNTY, TEXAS — SHEET NUMBER 26



Land division corners are approximately positioned on this map.

Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

LIPSCOMB COUNTY, TEXAS — SHEET NUMBER 27

LIPSCOMB COUNTY, TEXAS NO. 27

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.
Land division corners are approximately positioned on this map.

2 315 000 FEET

825 000 FEET

(Joins sheet 22)

(Joins sheet 26)

(Joins sheet 28)

(Joins sheet 33)

2 340 000 FEET

810 000 FEET

641 640 639 638 637 636

592 593 594 595 596 597

553 552 551 550 549 548

504 505 506 507 508 509

Second Creek

Third Creek

Fourth Creek

WOLF CR

WOLF CREEK

27

N

2 Miles

10 000 Feet

Scale 1:24 000

1 0 1/4 1/2 3/4 1 1 000 2 000 3 000 4 000 5 000

1 0 1 000 2 000 3 000 4 000 5 000

(28)

LIPSCOMB COUNTY, TEXAS — SHEET NUMBER 28

N

2 Miles

10 000 Feet

1 5 000

(Joins sheet 27)

Scale 1:24 000

0 0

¼ 1 000 2 000

½ 3 000

¾ 4 000

1 5 000

810 000 FEET

(Joins sheet 23)

2 365 000 FEET

825 000 FEET

(Joins sheet 29)

(Joins sheet 34)

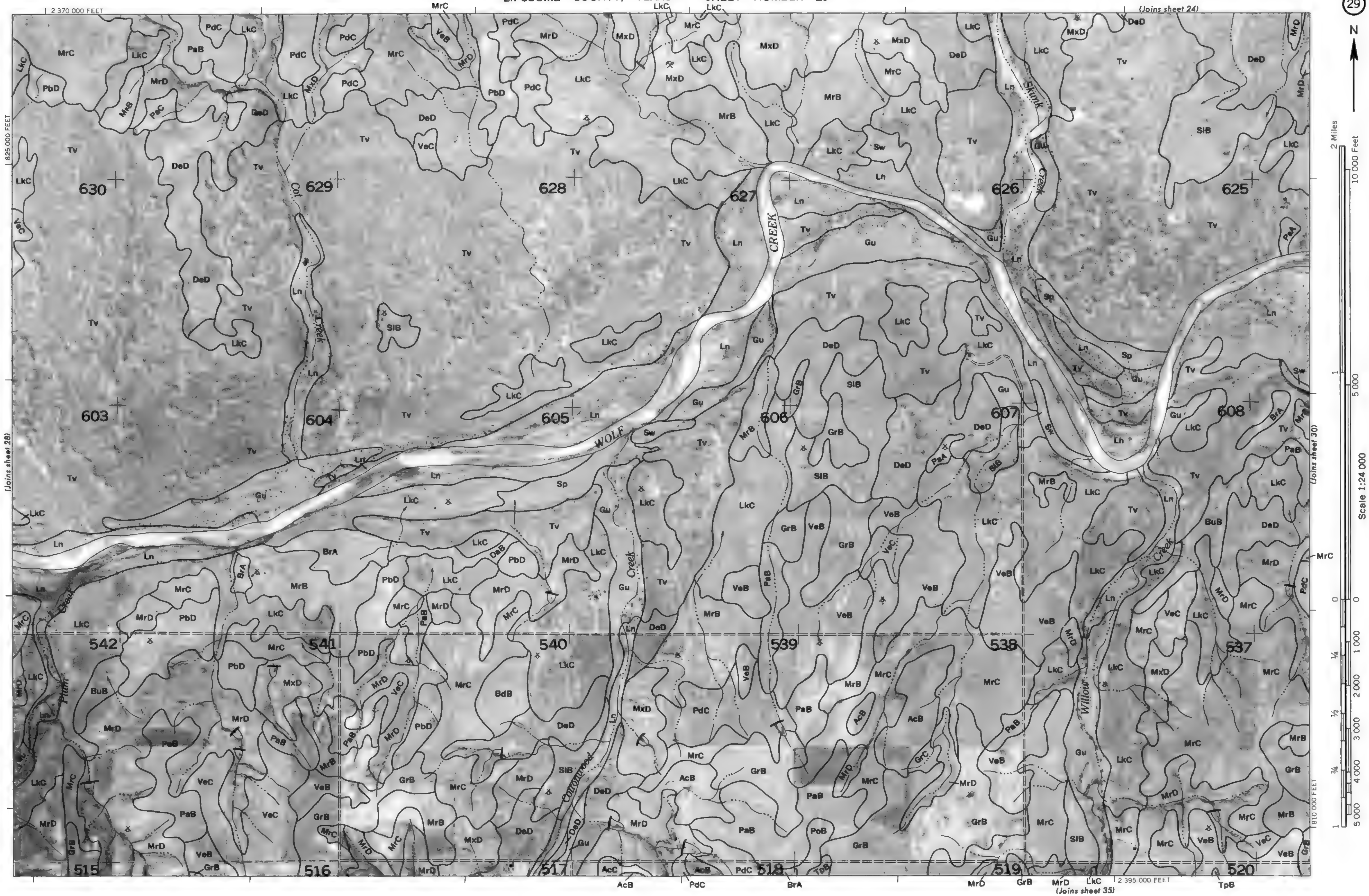
2 345 000 FEET

Land division corners are approximately positioned on this map.

Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

LIPSCOMB COUNTY, TEXAS NO. 28



LIPSCOMB COUNTY, TEXAS NO. 29

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

Land division corners are approximately positioned on this map.

30

N

2 Miles

10 000 Feet

Scale 1:24 000

1 5 000 0 1 000 2 000 3 000 4 000

1 5 000 0 ¼ ½ ¾ 1

(Joins sheet 29)

(Joins sheet 31)

(Joins sheet 36)

2 425 000 FEET

1 825 000 FEET

2 400 000 FEET

1 810 000 FEET

WOLF CREEK

Wolf Creek Canyon

Camp Creek

624 623 622 621 620

609 610 611 612 613

536 535 534 533 532

521 522 523 524 525

1454

Land division corners are approximately positioned on this map.

Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

LIPSCOMB COUNTY, TEXAS NO. 30

LIPSCOMB COUNTY, TEXAS — SHEET NUMBER 31

31

N

LIPSCOMB COUNTY, TEXAS NO. 31

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.
Land division corners are approximately positioned on this map

2 Miles
10 000 Feet
1
5 000

Scale 1:24 000

0 1 000 2 000 3 000 4 000 5 000 Feet

(Joins inset, sheet 20)
(Joins sheet 30)
(Joins upper right)
(Joins lower left)
(Joins sheet 36)
(Joins sheet 42)

2 430 000 FEET
825 000 FEET
805 000 FEET
810 000 FEET
790 000 FEET

OKLAHOMA
ELLIS COUNTY

WOLF Creek
Bridge
TRAIL
Long
Creek

LIPSCOMB COUNTY, TEXAS — SHEET NUMBER 32

32

N

2 Miles 10 000 Feet

1 5 000

Scale 1:24 000

0 0

1/4 1 000

1/2 2 000

3/4 4 000

1 5 000

3 000 FEET

2 310 000 FEET

805 000 FEET

790 000 FEET

2 285 000 FEET

(Joins sheet 26)

(Joins sheet 33)

(Joins sheet 37)

OCHILTREE COUNTY

WOLF CREEK

WOLF CR

Gibson Creek

Buffalo Creek

499 500 501 502 503

470 469 468 467 466

411 412 413 414 415

382 381 380 379 378

23

Ln BeD BrA BrB PdC PbD MxD AcB EsB Gu Sp BuB MrD GrC AcC MrC McB TpB VeB GrB OlB DeA VeC TpA PrD

Land division corners are approximately positioned on this map.

Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

LIPSCOMB COUNTY, TEXAS NO. 32

LIPSCOMB COUNTY, TEXAS — SHEET NUMBER 33

33

LIPSCOMB COUNTY, TEXAS NO. 33

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.
Land division corners are approximately positioned on this map.

2 315 000 FEET

805 000 FEET

(Joins sheet 27)

(Joins sheet 32)

(Joins sheet 34)

(Joins sheet 38)

2 340 000 FEET

504 505 506 507 508 509

465 464 463 462 461

416 417 418 419 420 421

377 376 375 374 373 372

Creek

Sand

N

Scale 1:24 000

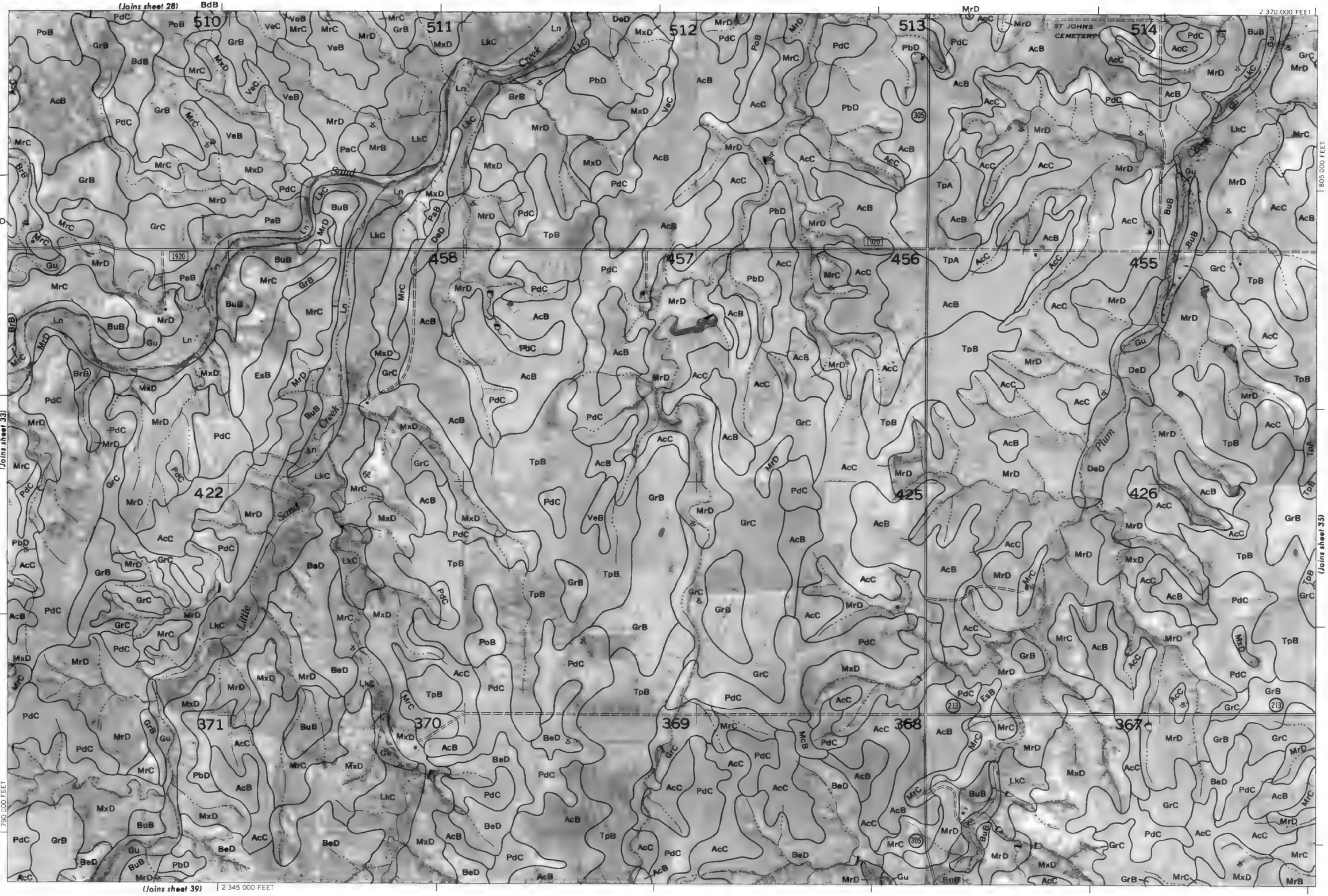
2 Miles 1 0

10 000 Feet 5 000 0

1 000 2 000 3 000 4 000 5 000

1/4 1/2 3/4 1

1920



Land division corners are approximately positioned on this map.

Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

LIPSCOMB COUNTY, TEXAS NO. 34

LIPSCOMB COUNTY, TEXAS — SHEET NUMBER 35

LIPSCOMB COUNTY, TEXAS NO. 35

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station
Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.
Land division corners are approximately positioned on this map.

35

N

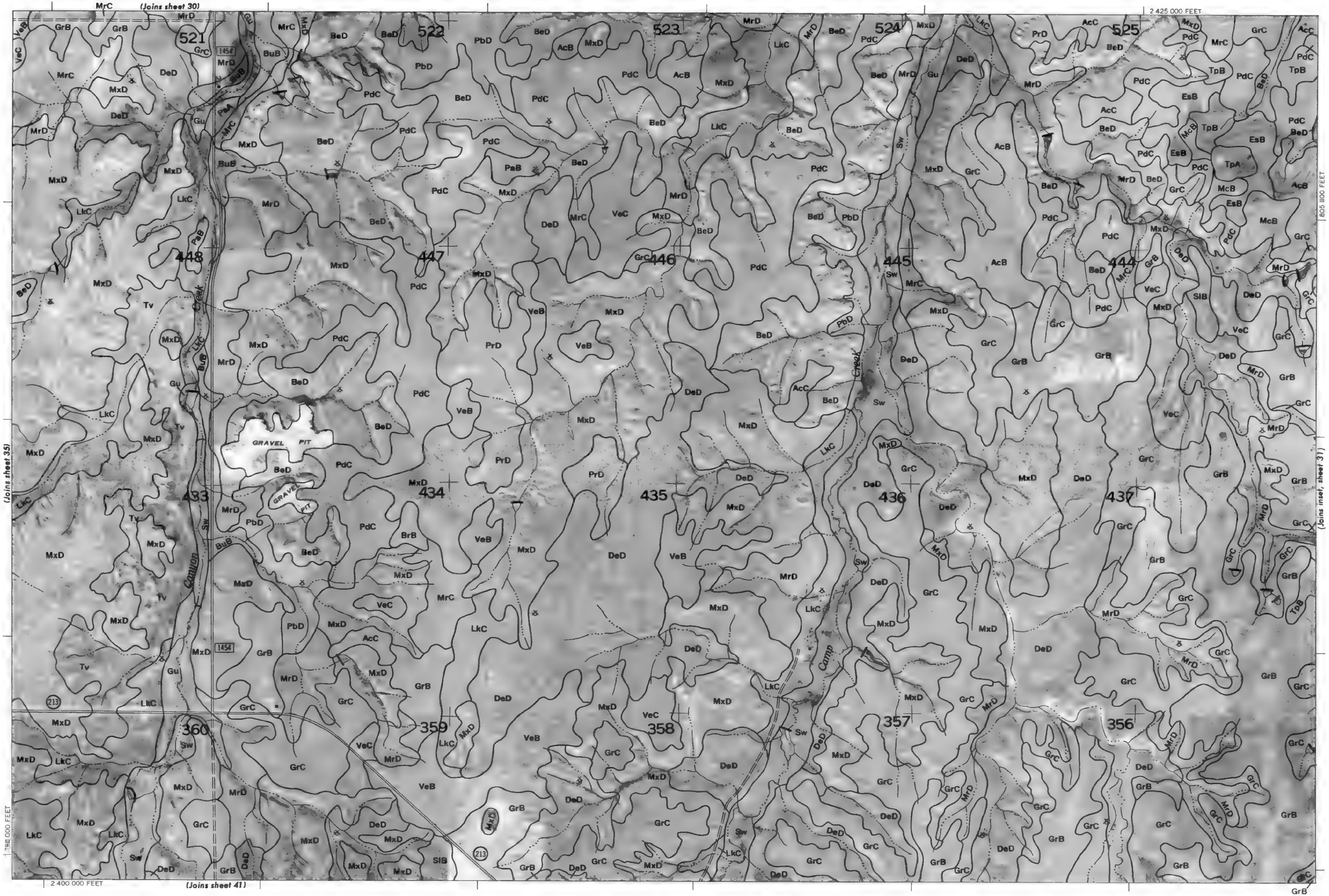
2 Miles
10 000 Feet
5 000
4 000
Scale 1:24 000
0
0
1 000
2 000
3 000
4 000
5 000

2 370 000 FEET
805 000 FEET
790 000 FEET
2 395 000 FEET

(Joins sheet 34)
(Joins sheet 29)
(Joins sheet 36)
(Joins sheet 40)

Cottonwood Creek
Willow Creek

LIPSCOMB COUNTY, TEXAS — SHEET NUMBER 36



N

Scale 1:24 000

2 Miles — 10 000 Feet

1 — 5 000 — 0

¼ — 1 000 — 0

½ — 2 000 — 1 000

¾ — 4 000 — 3 000

1 — 5 000 FEET

Land division corners are approximately positioned on this map.

Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

LIPSCOMB COUNTY, TEXAS NO. 36

LIPSCOMB COUNTY, TEXAS — SHEET NUMBER 37

LIPSCOMB COUNTY, TEXAS NO. 37

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.
Land division corners are approximately positioned on this map.

37

N

2 285 000 FEET

785 000 FEET

770 000 FEET

2 310 000 FEET

OCHILTREE COUNTY

(Joins sheet 32)

(Joins sheet 38)

(Joins sheet 43)

Buffalo Creek

Horse Cr

323 324 325 326 327

294 293 292 291 290

235 236 237 238 239

206 205 204 203 202

2 Miles

10 000 Feet

Scale 1:24 000

1 5 000 0 1 000 2 000 3 000 4 000 5 000

38

LIPSCOMB COUNTY, TEXAS — SHEET NUMBER 38

N

(Joins sheet 33)

2 340 000 FEET

2 Miles

10 000 Feet

Scale 1:24 000

(Joins sheet 37)

5 000

0

1 000

2 000

3 000

4 000

5 000 FEET

770 000 FEET

(Joins sheet 44)

2 315 000 FEET

(Joins sheet 39)

785 000 FEET

328 329 330 331 332 333

289 288 287 286 285 284

240 241 242 243 244 245

201 200 199 198 197 196

Locust Grove

1920

Land division corners are approximately positioned on this map.

Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

LIPSCOMB COUNTY, TEXAS NO. 38

LIPSCOMB COUNTY, TEXAS — SHEET NUMBER 39

39

LIPSCOMB COUNTY, TEXAS NO. 39

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.
Land division corners are approximately positioned on this map.

2 345 000 FEET

785 000 FEET

770 000 FEET

2 370 000 FEET

(Joins sheet 38)

(Joins sheet 34)

(Joins sheet 40)

(Joins sheet 45)

N

Scale 1:24 000

2 Miles 10 000 Feet 1 5 000 0 0 ¼ 1 000 ½ 2 000 ¾ 3 000 1 4 000 5 000

LIPSCOMB COUNTY, TEXAS — SHEET NUMBER 40

N

2 Miles 10 000 Feet

1 5 000

Scale 1:24 000

0 0

¼ 1 000

½ 2 000

¾ 4 000

1 5 000

(Joins sheet 39)

(Joins sheet 35)

(Joins sheet 41)

(Joins sheet 46)

2 395 000 FEET

786 000 FEET

720 000 FEET

2 375 000 FEET

339 340 341 342 343 344

278 277 276 275 274 273

251 252 253 254 255 256

190 189 188 187 186 185

Cottonwood Creek

Willow Creek

Canyon Creek

Land division corners are approximately positioned on this map.

Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

LIPSCOMB COUNTY, TEXAS NO. 40

LIPSCOMB COUNTY, TEXAS — SHEET NUMBER 41

LIPSCOMB COUNTY, TEXAS NO. 41

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.
Land division corners are approximately positioned on this map.

2 400 000 FEET

785 000 FEET

(Joins sheet 36)

(Joins sheet 40)

(Joins sheet 42)

(Joins sheet 47)

2 425 000 FEET

775 000 FEET

41

N

2 Miles

10 000 Feet

5 000

Scale 1:24 000

0 0

¼ 1 000

½ 2 000

¾ 3 000

1 4 000

5 000

Creek

Canyon

Camp

Tank

345 346 347 348 349

272 271 270 269 268

257 258 259 260 261

184 183 182 181 180

MxD DeD GrB GrC SIB LkC Sw MrD Tv VeC AcC

N

Scale 1:24 000

2 Miles 10 000 Feet

1 5 000 0 1 000 2 000 3 000 4 000 5 000

(Joins inset, sheet 31)

(Joins sheet 41)

(Joins lower left)

(Joins sheet 47)

(Joins upper right)

2 440 000 FEET

2 430 000 FEET

790 000 FEET

775 000 FEET

770 000 FEET

755 000 FEET

OKLAHOMA

ELLIS COUNTY

HEMPHILL COUNTY

HIGGINS AIRPORT

SANTA FE AND TOPEKA AND ATCHISON

COMANCHE

HIGGINS

Land division corners are approximately positioned on this map.

Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

LIPSCOMB COUNTY, TEXAS — SHEET NUMBER 43

LIPSCOMB COUNTY, TEXAS NO. 43

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.
Land division corners are approximately positioned on this map.

2 285 000 FEET

765 000 FEET

(Joins sheet 37)

(Joins sheet 44)

2 310 000 FEET

750 000 FEET

OCHILTREE COUNTY

ROBERTS COUNTY

HEMPHILL COUNTY

Horse Creek

West Horse Creek

Scale 1:24 000

2 Miles

10 000 Feet

5 000

LIPSCOMB COUNTY, TEXAS — SHEET NUMBER 44

(44)

N

(Joins sheet 38)

(Joins sheet 43)

(Joins sheet 45)

2 340 000 FEET

765 000 FEET

2 315 000 FEET

750 000 FEET

HEMPHILL COUNTY

Timber Creek

Big

1920

2 Miles

10 000 Feet

5 000

Scale 1:24 000

0 1 000 2 000 3 000 4 000 5 000

¼ ½ ¾ 1

Land division corners are approximately positioned on this map

Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

LIPSCOMB COUNTY, TEXAS NO. 44

LIPSCOMB COUNTY, TEXAS — SHEET NUMBER 45

45

N

LIPSCOMB COUNTY, TEXAS NO. 45

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.
Land division corners are approximately positioned on this map.

2 345 000 FEET

765 000 FEET

755 000 FEET

2 370 000 FEET

(Joins sheet 44)

(Joins sheet 39)

(Joins sheet 46)

158 159 160 161 162

107 106 105 104 103

71 72 73 74

HEMPHILL COUNTY

2 Miles

10 000 Feet

5 000

Scale 1:24 000

(Joins sheet 40)

2 400 000 FEET

770 000 FEET

(Joins sheet 45)

(Joins sheet 47)

755 000 FEET

2 375 000 FEET

HEMPHILL COUNTY

Scale 1:24 000

2 Miles

10 000 Feet

Land division corners are approximately positioned on this map.

Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

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LIPSCOMB COUNTY, TEXAS NO. 46

LIPSCOMB COUNTY, TEXAS NO. 47

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Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

Land division corners are approximately positioned on this map.